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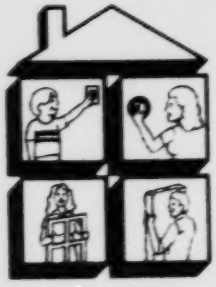

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Newfoundland & Labrador Home Energy Advisory Pilot Project

FINAL REPORT

SHAWMONT NEWFOUNDLAND LTD.

CONSULTING & MANAGEMENT SERVICES

Energy, Mines and Resources Canada

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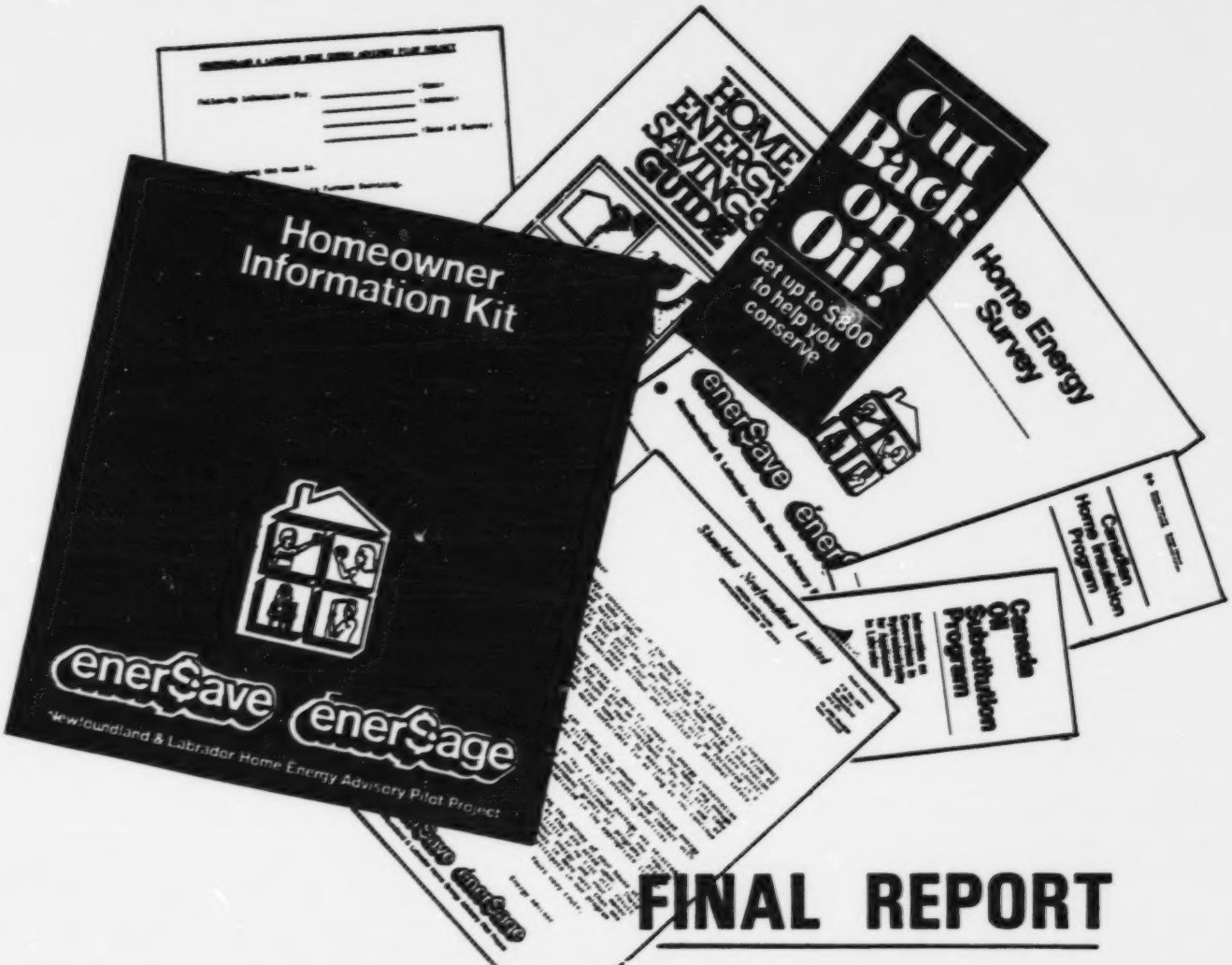
Newfoundland & Labrador Home Energy Advisory Pilot Project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FINAL REPORT

Project Management – ShawMont Newfoundland Ltd.

Professional & Technical Assistance – IBI Group

– Saga Communications Ltd.

– Omnifacts Ltd.

– College of Trades & Technology

– Micro-Tech Ltd.

– Aiden Duff Ltd.

ENERGY MINES AND RESOURCES CANADA

NEWFOUNDLAND AND LABRADOR
HOME ENERGY ADVISORY PILOT PROJECT
FINAL REPORT

Prepared by:

SHAWMONT NEWFOUNDLAND LIMITED

SMR-10-83

May, 1983

ShawMont Newfoundland Limited

VIRGINIA PARK PLAZA
NEWFOUNDLAND DRIVE, ST. JOHN'S

Postal Address

P.O. Box 9600
St. John's
Newfoundland
A1A 3C1

Ph. (709) 754-0250
Telex: 016-4122

1983 06 08

File: DSS 7983-4

Mr. Jack Smith
Chief, Residential Buildings
Policy and Program Development Division
Energy Conservation and Oil Substitution Branch
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4

Dear Mr. Smith:

We are pleased to submit the Final Report for the Newfoundland and Labrador Home Energy Advisory Pilot Project. If you have any questions regarding the information contained in the report, please do not hesitate to call.

Yours very truly,

R. W. Lewis, P. Eng.
Engineering Manager

TAD/cmk

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  E.C.A.P. Audit Kaypro Version #1 - St. John's

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EXECUTIVE SUMMARY

GENERAL

The "Newfoundland and Labrador Home Energy Advisory Pilot Project" was commissioned by Energy Mines and Resources Canada on August 9, 1982 in support of the Enhanced Conservation Assistance Program. The work was carried out by a consortium of companies and organizations with expertize in project management and engineering, residential housing construction, data collection and communications, training and education, software development, and building science. The aim of the project was to develop and field test a residential energy analytical and advisory service for the Province of Newfoundland and Labrador that would assist the homeowner in the adoption of energy conservation as a personal and/or family lifestyle goal. The service provided interested homeowners with a detailed listing of energy conservation retrofits that should be carried out in the home, complete with cost estimates and potential energy savings for each retrofit option. The Newfoundland and Labrador Home Energy Advisory Pilot Project basically comprised the developments, scheduling and completion of the following eight major components over a six (6) month period:

(1) Staff Orientation
(2) Advisor Selection and Training
(3) Procedure Development
(4) Testing and Experimentation
(5) Main Pilot Field Test
(6) Information Component
(7) Management Plan
(8) Deliverables (reports, data, and other information)

PROJECT DESCRIPTION

Immediately subsequent to the award of the contract, key members of the project team attended a two week orientation session at Holland College in Charlottetown, Prince Edward Island. The session, which was organized by Audit Delivery Systems of Prince Edward Island, provided background and information on the evolution and history of the ENERPLAN home energy advisory service. Details of the planning, organization and implementation of the Prince Edward Island pilot project, as well as conclusions and recommendations pertaining to the ENERPLAN Procedure were presented. The two week orientation session provided valuable guidance during the planning and scheduling stages of the Newfoundland Pilot Project and was useful in minimizing delays and inefficiencies in work throughout the project.

Immediately following the orientation session, work commenced on the procurement of the advisor's equipment. With the exception of the type of micro-computer and some minor changes, the same advisor equipment kit was used in the Newfoundland project as was used in the Prince Edward Island pilot project. Based on results of a market search, the KayPro micro-computer was selected over the Osbourne micro-computer.

Following a detailed review of the Prince Edward Island ENERPLAN Procedure, the Newfoundland procedure development commenced. The Prince Edward Island computer software was modified to accomodate regional specific data and refined with respect to accuracy. A detailed listing of all possible energy retrofits for the Newfoundland

PROJECT DESCRIPTION (Cont'd)

housing stock was compiled, complete with cost estimates for the work. This and other pertinent data was then incorporated into the Prince Edward Island ENERPLAN software package and other software changes made to create the Newfoundland ENERSAVE Procedure. Subsequent field testing of the new ENERSAVE Procedure by the project team indicated that the software accurately predicted the cost of energy conservation retrofits and savings for typical Newfoundland housing stock.

During the initial stages of the project, work commenced on the selection of energy advisors and the development of a training program. Advisor selection criteria was derived and positions for energy advisors were publically advertized. Completed applications were subsequently reviewed and sorted and through a detailed screening process involving several interviews, eight individuals from an original total of eighty-five applicants were selected to attend a six week training course.

The training course was developed by first determining the course objectives and identifying the skills required by the advisors. This permitted course topics to be specified and a time table to be derived. The course, which was segmented into fifty Instructional Time Units of approximately three hours duration each, was delivered by permanent staff from the educational facility (the College of Trades and Technology in St. John's), key members from the project team and a total of eighteen guest lecturers from the private sector.

PROJECT DESCRIPTION (Cont'd)

Following successful completion of the training course, four of the eight advisors were selected to participate in the main pilot field test. The advisors were selected on the basis of their performance throughout the training course in both the field and the classroom. Over one hundred homes were surveyed during the main pilot which was carried out from November 22 to December 14, 1983. The dwellings were selected on the basis of a predetermined selection criteria which was derived from information contained in a Newfoundland and Labrador housing stock analysis report and a socio-economic survey, both of which were completed during the initial stage of the project. Areas with a high concentration of residences exhibiting typical Newfoundland housing age and construction were identified by windshield surveys, and potential program participants were solicited in these areas by mail. Completed application forms were screened to identify typical housing stock and other household characteristics and homeowners were contacted using a dispatcher system.

The dispatcher identified a mutually convenient time with the homeowner to have a survey carried out and was responsible for assigning an advisor to perform this survey. Two surveys per day per advisor were scheduled between Monday and Thursday of each week. The advisors were required to follow the procedures established during the training course when carrying out a survey, which normally required three hours to complete. Each Friday was reserved for advisor debriefing in the morning and mail-outs and filing in the afternoon. The morning debriefing sessions provided an opportunity to discuss and solve problems which arose during the current week's surveys. Follow-up brochure information on selected topics was mailed to each homeowner on Friday afternoon.

PROJECT DESCRIPTION (Cont'd)

Following the completion of the main pilot field test in December 1982, work commenced on the analysis of data and the preparation of the final report. This report essentially summarized information previously contained in other deliverables and included a proposed management plan for the delivery of a full scale home energy advisory program. The draft final report was completed during the first two weeks in April, 1983 and presented orally in Ottawa to representatives of Energy, Mines and Resources on April 13, 1983.

MAJOR CONCLUSIONS

.1 The two week Prince Edward Island session was effective in providing the necessary guidance and orientation to the project team in the organization of the Newfoundland Pilot Study.

.2 With the exception of a few minor points, equipment selected for use by the energy advisors performed well during the pilot study and is adequate for household surveys of the type performed during the study.

.3 Modifications and changes made to the Prince Edward Island ENERPLAN software were successful in producing a Newfoundland Procedure capable of accurately predicting the cost of energy conservation retrofits and savings for typical Newfoundland housing stock.

MAJOR CONCLUSIONS (Cont'd)

.4 The advisor selection criteria developed during the pilot study and selection process were effective in identifying individuals with the necessary background and expertise to train as energy advisors.

.5 The use of a high percentage of guest lecturer's during the training program can cause problems with respect to quality control and course continuity.

.6 Based on the performance of the energy advisors during the main pilot field test, the training program provided the students with at least the minimum technical knowledge needed to perform residential energy surveys, however, the course was too short to adequately refine audit delivery techniques.

.7 The use of selection criteria developed from a housing stock analysis in conjunction with windshield surveys is an effective way of selecting target sites from which typical house types can be solicited.

.8 The dispatcher system is an effective method of setting up survey appointments if homeowners are contacted during the evening.

.9 The development of an effective communications program, both in terms of interpersonnal communications and for the preparation of supporting information is essential to the success of a home energy advisory program. The communications program must be the responsibility of a reputable public relations/-marketing company.

MAJOR CONCLUSIONS (Cont'd)

.10 Based on the results of the main pilot, there is a definite requirement for a home energy advisory service for the province of Newfoundland and Labrador. It is felt that a high percentage of the homeowners surveyed during the main pilot were unaware of the full potential for energy retrofit in their homes. In general, homeowners were unaware of the available government grants which could assist them to carry out energy retrofit. In most cases previous efforts by the homeowner to improve the home's energy efficiency have been concentrated in areas considered to be of low priority in an energy survey.

SUMMARY OF RECOMMENDATIONS

The following is a summary of all the recommendations presented in the report. The recommendations, which have been based on the experiences gained in the Newfoundland and Labrador Home Energy Advisory Pilot Study are intended to provide guidance and assistance in the establishment of future pilot or full scale audit programs on both a provincial and/or national level.

Equipment

.1 Based on the experience gained from use of both the Osbourne and KayPro micro-computers, serious consideration should be given to selecting a micro-computer which has operational characteristics similar to the KayPro. The nine inch screen was

Equipment (Cont'd)

found to be very useful in terms of inputting and displaying data. The double density discs had a number of definite advantages for use in the data base management system. The most important criteria which should be considered when selecting a micro-computer is the availability of local support and servicing for the system.

.2 To minimize the possibility of damage and voiding of the manufacturer's warranty, equipment such as the Dedesco Furnace Efficiency Tester should not be removed from its original carrying case.

.3 A two month delivery date for equipment such as the micro-computer, the Dedesco Furnace Efficiency Tester and the Bacharach Smoke Tester should be considered when initially ordering equipment.

.4 Consideration should be given to using an electric drill (as opposed to a hand punch or hand drill) to produce the test hole required in the furnace flue pipe. Ideally it would be best to use cordless drills but the added expense may not justify their use.

.5 When arrangements are being made to carry out surveys in remote or isolated areas, consideration should be given to the availability of supplies such as batteries and camera film.

Equipment (Cont'd)

.6 When surveying homes during extremely cold conditions, equipment should always be kept warm as much as possible to prolong battery life. The equipment should never be left overnight in an unheated area such as a car.

.7 Due to problems experienced with cheaper brand name products, it is recommended that a five inch Samsonite attaché case or equivalent be used as an equipment case.

Procedure Development

.1 Infiltration Subroutine

Some concern has been expressed regarding the use of moisture as a tracer gas to determine the infiltration rate for the home. It is felt that because of the high relative humidities found in coastal regions of the province especially during late fall and late spring (part load conditions) the moisture tracer gas method may underestimate the air change in the house and therefore produce erroneous results. Other methods for calculating or estimating infiltration (such as the new Yukon subroutine which uses a crack length method) should be thoroughly examined and the existing infiltration subroutine modified accordingly if more accurate techniques are available and proven. The exposure factor which increases the infiltration rate in the house should also be adjusted for areas of consistently high winds such as St. John's.

Procedure Development (Cont'd)

.2 Cost Totalling Subroutine

The present procedure is set up to present recommended savings as if each recommendation would be the only one implemented. This can lead to the situation where the total savings presented to the homeowner can exceed the energy bill of the house.

A new subroutine should be developed to accumulate the savings within each of the four main recommendation categories on the Home Energy Survey recommendation sheet and correlate savings totals at the four categories so that they are realistic. Net energy gains would be allowed in the case of a passive or active solar heat house. A recommended procedure would be to use the method in N.R.C. Building Practice Note 20, May 1981.

.3 Data Input Subroutine

The existing procedure has been set up so that regional variables such as contractor costs and weather data are contained within the computer code on a line by line basis. This becomes very time consuming when new regional versions must be developed. A superior subroutine should be developed to access individual data files corresponding to each region as required by specifying a city/region from an input menu when the data is required.

Procedure Development (Cont'd)

.4 Recommendations Resulting From the Alternative Audit Review

A study of audit procedures being used in other jurisdictions was undertaken by the project team. This study presented the following recommendations for modifications to the ENERPLAN Procedure:

.1 Effect of attached unheated garages: The presence of an attached unheated garage is an extra insulation on the garage portion of the wall dividing the house and garage. That portion of the wall should be assigned an additional RSI 0.9 (R5) for purposes of heat loss calculations.

.2 Insulating shutters: The information collection should have some means of noting whether insulating shutters are being used and estimating their effects.

.3 Fireplace: The information collection form should include the extent to which conventional fireplaces are used (hours/week) and whether they have energy efficiency features such as direct intake of outside air for combustion, glass doors, and a heat exchanger for ducted air. This information could be useful for compiling a statistical data base.

Procedure Development (Cont'd)

.4 Recommendations Resulting from the Alternative Audit Review (Cont'd)

.4 Estimating energy saving in the 5th Year: In addition to providing the homeowner with information on first year energy savings, it may be very effective to estimate the energy cost savings in current dollars during the fifth year, based on some form of annual price rise (eg. 8% - 10% per year) to underscore the significance of the ongoing and increasing savings possible.

.5 Wind/Dilution Interaction: The effects of high winds on dilution rates (percent of heat loss up the chimney due to wind forces across the top of the chimney) may have to be considered in areas of high wind. The Newfoundland average wind is in the range of 22 kph (11.6 - 27.7 kph for 4 stations). Local weather station data regarding wind should be checked and in high wind conditions (say, over 29 kph on average), efficiency of the wood burning equipment could be reduced by. (Five percentage points may be appropriate). Further work on this is being conducted at the Canadian Combustion Research Laboratory.

.6 Furnace, Stove Location: Furnace and stove location have an important impact. Although the Prince Edward Island study found sufficient evidence that the conventional wood-fired

Procedure Development (Cont'd)

.4 Recommendations Resulting from the Alternative Audit Review (Cont'd)

central heating system rated a higher level of efficiency than for stoves, allowance should be made for position of the stove. Locating it on an outside wall affects the seasonal efficiency because of reliance on convection currents and radiation to reach the remainder of the home. A reduction of 15 percentage points could be assigned to wood stoves providing primary heat which are located against an outside wall, but further work is required to specifically include this item.

Selection Criteria for Energy Advisors

.1 The establishment of a review board to carry out a series of interviews is essential in the selection process for trainee advisors.

.2 Superior levels of higher education should not be considered of major significance in the selection requirements.

.3 In combination with communication skills, previous academic skills related to technical matters are a useful guide in identifying potential energy advisors.

Selection Criteria for Energy Advisors (Cont'd)

.4 Notwithstanding the previous recommendations, good communication skills alone are sufficient, providing the technical skills can be adequately obtained.

Communication Aspects

.1 Interpersonnel Communications

.1 The ability to communicate effectively is the number one selection criteria for advisor trainees.

.2 It is necessary to increase the communications time in the field via more 'real' audits, with the communications instructor having closer involvement with both the field and classroom activities.

.3 The amount of time spent on technical details in the classroom should be increased to allow the trainees to become more confident with the technical aspects of the survey and hence better able to be effective communicators.

.4 Advisors should telephone homeowners the day prior to the survey and recap the main points of the survey.

.2 Communications Support

.1 The pre-survey brochure must be more effective in its explanation of the program.

Communication Aspects (Cont'd)

.2 Communications Support (Cont'd)

.2 The main publication on energy savings methods should be Canadian and designed such that certain sections could be interchangeable and devoted to regional specific peculiarities, whether to do with climate, construction practices, standards, etc.

.3 The products displayed in the sample case must be readily available locally. In St. John's some products displayed had very little circulation in local stores.

.4 The three ring binder presentation for the Homeowner Information Kit should be adopted for a main program.

.5 If the giveway concept is to be retained, something more meaningful than a decal is required. Perhaps the giveways should be geared to a particular segment of the population, eg. children.

.6 The development of a structural communications program must ensure that the audit program will receive take-up support from the general public within the capabilities of the group(s) selected to effectively administer the program.

.7 The communications program must be the responsibility of a reputable public relations/marketing company.

Training Course Recommendations

.1 The use of guest speakers must be strictly controlled to assess the speakers ability to lecture effectively, maintain continuity of lectures and ensure lectures are prepared properly.

.2 A text book should be prepared for the course.

.3 A full time co-ordinator for the duration of the training course is essential to maintain continuity between lectures and to supplement materials relevant to the technical aspects of the course.

.4 Course length should be extended by at least two weeks.

.5 All trainees should be certified upon completion of the course.

.6 Emphasis on basic technical content must be maintained; more 'hands-on' experience would be useful.

.7 The communications lecturer should also be closely involved with the development of the home survey communications approach.

.8 The course should make allowance for a greater practical involvement in home survey techniques.

.9 Due to its specialist nature, the training course should not be offered as part of the regular curriculum of the educational establishment.

Training Course Recommendations (Cont'd)

.10 Courses should be run only when there is a requirement for advisors. A stand-by list of advisors may have to be maintained.

.11 The group(s) given the responsibility of running the audit program must be involved in the preparation and delivery of the training course.

.12 Research should be conducted into potential employment opportunities for residential energy advisors other than with the group(s) responsible for running the audit program.

.13 The training program should be extended to give the advisors more time to study technical related material. Consideration should be given to extending the course to a three month duration followed by a written technical exam which must be passed to become an energy advisor. It was felt that the advisors selected for the main pilot were basically good communicators, however, on a few occasions their lack of knowledge of some technical aspects reduced self-confidence and may have resulted in a reduction of homeowner confidence.

.14 The number of sample surveys should be increased during the last part of the training course. It is felt that the advisor should lead a minimum of ten (10) surveys under close supervision of 'trained' personnel. In so doing, the advisor will have a better chance to develop proper audit delivery techniques, thus, minimizing potential problems in the field such as data formatting and equipment use.

Main Pilot

.1 The Department of Energy, Mines and Resources in liason with the consultant should initiate a public relations campaign. This would not only increase the awareness of the public with respect to the program but would also increase the credibility of the program (there were occasions during the project when the homeowner questioned the authenticity and credentials of the project and its members). This, in turn, would act to increase response rate and homeowner co-operation.

.2 The dispatcher, who is normally the first person to speak to the homeowner, should be thoroughly familiar with the program. In this way homeowners who have a marginal interest in the program, could be given positive reinforcement to procede with the survey.

.3 It should be reaffirmed, in the letter accompanying the survey application, the importance of returning the application before the deadline date. In the program at hand, even though between two and three weeks were given for return of the application, because of the low early response rate applications had to be accepted up to a month after the deadline. In fact in one case a homeowner returned the application three months late.

.4 The possibility of implementing evening and/or weekend appointments for homeowners who are unavailable during regular working hours should be considered, however, in the case of evening surveys, hours of available daylight may be a limiting factor.

Main Pilot (Cont'd)

.5 Cancellations must be minimized in future projects. In the case of the Newfoundland Pilot Study, a list of homeowners who were available to have their homes surveyed on short notice was compiled. This system would be impractical for a national program and would, at best, be an administrative nightmare. It is felt that if the survey program were made mandatory for COSP eligibility, the cancellations would be minimized. If a non-mandatory program is adopted, some sort of bonus system such as tax credit may encourage homeowners to keep appointments. It a decision is made to have homeowners contribute to the cost of the survey, a down-payment required with the appointment request would also minimize cancellation.

.6 If a national program is implemented, trained inspectors should be hired by Energy, Mines and Resources to monitor and evaluate energy advisors in the field. In so doing, homeowners would be assured of receiving a high quality service.

.7 All future energy advisors should be certified. There have been reports during the pilot study that homeowners had already been solicited by other individuals and companies offering home surveys. Such individuals, if not properly trained, could seriously jeopardize the validity of the whole program. Homeowners should be encouraged to have surveys carried out by only certified advisors.

Main Pilot (Cont'd)

.8 A continuing education program should be implemented to keep advisors informed of the latest developments in residential energy technology.

.9 Key individuals should be made available to the advisor to answer questions on all aspects of the survey. In the Newfoundland Pilot Study, this was accomplished during the Friday morning debriefing sessions. It is unlikely that a regular Friday morning debriefing would be required for 'experienced' advisors, however, someone will be needed to address questions and give answers on procedure and technical problems.

.10 A review agency should be established with a mandate to review and update all aspects of the procedure, as required, based on experience gained through the pilot projects and a possible national program.

PART ONE

INTRODUCTION

1.0 INTRODUCTION

The following report is the last of a series of deliverables required under DSS Contract Number 02SQ.23216-2-6967 entitled "Canadian Oil Substitution Program - Pilot Study in Newfoundland". The project, hereafter referred to as the "Newfoundland and Labrador Home Energy Advisory Pilot Project" was commissioned by the Department of Energy, Mines and Resources on August 9, 1982 in support of the Enhanced Conservation Assistance Program, the conservation component of COSP.

The report, prepared in accordance with the requirements outlined in the contract for the project, is an all encompassing document which attempts to accomplish two main objectives:

.1 Provide a complete and thorough documentation of all the work carried out during the project.

.2 Provide conclusions and recommendations based on experience gained through the planning, organization and implementation of the Newfoundland project for consideration in possible future pilots or programs in Newfoundland and Labrador, and in other parts of Canada as may be applicable.

The report is essentially a summary document and contains material previously presented in a number of reports which were required as deliverables under the contract. Specifically, material from the following documents has been used in this report:

1.0 INTRODUCTION (Cont'd)

Report SMR-31-82 -"Preliminary Finding of the Housing Stock Analysis and Home Selection Criteria Report".

Report SMR-32-82 - "Training Course Objectives and Draft Outline".

Report SMR-29-82 - "Executive Summary"

Report SMR-36-82- "Draft Version of the Homeowner Education Package"

Report SMR-9-83 - "Alternate Audit Comparison"

Report SMR-7-83- "Procedure Development - Technical Report"

Report SMR-8-83 - "Final Training Package Information Report"

Report SMR-38-82 - "Phase I Report"

Report SMR-2-83 - "Phase II Report

Report SMR-4-83 - "Phase III Report"

To best meet the objectives previously mentioned in this section, the report has been divided into four (4) major sub-sections as follows:

- Project Evolution and History
- Project Components
- Field Testing and Data Management
- Management Plan

1.0 INTRODUCTION (Cont'd)

In the Project Evolution and History Section, a listing of all companies, organizations and institutions who participated in the project has been provided, complete with a critique of their involvement and the specific tasks required for each participant. The background, issues and objectives of the residential advisory service and the Newfoundland pilot project are also described.

The Project Component Section contains a complete listing of all the individual project components which constitute the Newfoundland and Labrador Home Energy Advisory Pilot Project. Descriptions have been presented in sufficient detail to provide the background and rationale from which conclusions and recommendations are made.

The Field Testing and Data Management Section is separated from the Components section as it represents the final combination of all the component parts of the project in the implementation of the Main Pilot.

The Management Plan provides a rationale for implementing a full scale program in the province and describes methods by which this may be achieved. Costing information is provided to back-up discussions on the various formats that a full scale program might take.

The Technical Appendices, presented in a separate volume of this report, contains summaries of statistics and results as referenced in the main body of the report. Samples of data sheets, forms and other sample documentation are also provided.

PART TWO

PROJECT EVOLUTION AND HISTORY

2.1 GENERAL

Over the past number of years the Government of Canada has committed itself to the effective management of the country's energy future. Programs such as the National Energy Program (N.E.P.) have announced many new policies which promote exploration for new energy sources and encourage the conservation and efficient management of present energy sources.

Energy, Mines and Resources Canada through the Canadian Home Insulation Program (CHIP) and Canadian Oil Substitution Program (COSP) provide grants of varying amounts to Canadian homeowners which encourage residential energy conservation as well as the implementation of off oil measures. The CHIP program applies to insulation while COSP grants are available for installation of renewable energy devices such as wood stoves, conservation measures associated with insulation upgrading, domestic hot water system modifications, heating systems retrofits, weatherstripping and caulking.

Recent reviews of successful application forms have produced statistics which are of some concern to officials responsible for implementing both the CHIP and COSP program. As expected, the majority of grants issued across the country have been for upgrading insulation and adding wood stoves. While it might appear that the main objectives of the program are being achieved it is felt that, quite often, the homeowner is overlooking more cost effective energy retrofits due largely to agressive promotional campaigns by both insulation contractors and wood stove suppliers. Energy, Mines and Resources Canada

2.1 GENERAL (Cont'd)

have, through recent studies on this problem, identified the potential need of a home energy advisory service. The main objective of such a service would be to provide interested homeowners with a detailed listing of energy retrofits which should be carried out in the home. The retrofits would be listed in order of priority for implementation and would be complete with cost estimates and paybacks. It is felt that through such a service, the homeowner would be given a clear picture of the energy conservation potential of the home and would be encouraged to implement retrofits which make the best use of the grants available.

2.2 BACKGROUND

Due to geographical, technical, and economic limitations, there are a number of areas in Canada which have a limited access to conventional energy sources. In such areas, homeowners are restricted in the number of viable off oil retrofits which qualify for grants under COSP. In recognition of the retrofit limitations imposed on the residents of these areas, the Enhanced Conservation Assistance Program (ECAP) was developed. ECAP is the conservation component of COSP and is available to residents of Newfoundland, Prince Edward Island, the Yukon and the Northwest Territories. As part of the ECAP program, Energy, Mines and Resources sponsored a project to develop a home energy advisory service.

2.2 BACKGROUND (Cont'd)

In the Spring of 1981 Millbank and Associates of Ottawa commenced development of a model residential audit service to support the objectives of ECAP in the four applicable regions. From this work evolved a procedure which was structured to facilitate a major field test.

Subsequent field testing and evaluation of the procedure proved to be encouraging however specific areas for further development work and refinement were identified. A decision was made by EMR early in the Spring of 1982 to further develop the Millbank Procedure and a contract was awarded to Audit Delivery Services, a consortium of two Prince Edward Island firms to carry out the development work. Over a ten month period, the PEI program resulted in the development of an energy advisor training program, a homeowner education package and a residential analysis and advisory service known as Enerplan. Enerplan evolved from substantial modification to the Millbank material including procedure computerization and development of a new home audit form to support the procedure.

Results from the PEI project seemed to substantiate the need for a home energy advisory service. In August, 1982, projects similar to the one in PEI were awarded to firms in Newfoundland, the Yukon and the Northwest Territories. In each project the aim was essentially the same; modify, develop and refine the Enerplan Procedure to accommodate regional specific parameters for the respective ECAP region.

2.3 ISSUES

During this third stage of development of a home energy advisory service, there were a number of important issues which needed to be addressed during the course of the Newfoundland pilot study. These issues were as follows:

- What are the conditions (ie. housing stock type, distribution of types of heating systems, ECAP qualifications, available retrofit options, moisture problems, social structure, energy conservation awareness and interest, etc.) specific to Newfoundland, which must be modified in the existing ENERPLAN procedure.

- Recognizing the above specific elements, to what extent can the ENERPLAN Procedure, in general, be adapted for use in Newfoundland?

- How technically accurate is the ENERPLAN Procedure? Can (and should) this accuracy be improved?

- How successful was the PEI training program and what changes in curriculum and material are needed to improve the program and adapt it to Newfoundland conditions?

- What is the most effective program by which the advisors can best learn the skills necessary to accomplish the objectives of the pilot?

- What are the most cost-effective analysis techniques? How can the energy advisor make the most use of his or her time with the homeowner?

2.3 ISSUES (Cont'd)

- Was the dissemination of information in PEI sufficiently complete? Was it timely? Does the same information apply to Newfoundland? How can maximum enlightenment of the homeowner be assured with respect to format, content and presentation of the information package?

2.4 OBJECTIVES

In consideration of the background and issues presented, as well as the terms of reference for the contract, the following main objectives were developed for the Newfoundland pilot study:

1. Review, modify, test and refine the ENERPLAN Procedure and techniques. This involved several sub-objectives as follows:

    - Modify data and sub-routine content to include Newfoundland specific data and conditions.
    - Ensure adequate and accurate sub-routines.
    - Ensure the procedure fitted Newfoundland housing types.
    - Refine the format to ensure efficient and effective data collection.
    - Present the homeowner with priorized, cost-effective recommendations.
    - Derive and evaluate various alternatives for the number of advisors required, collection and analysis procedures, communication strategies, etc.
    - Compare with other procedures.

2.4 OBJECTIVES (Cont'd)

2. Develop, deliver and evaluate a model training course for energy advisors. This includes developing a criteria for selecting advisors.

3. Develop, test and refine an audit delivery system.

4. Develop, test and evaluate a homeowner energy education package.

5. Set up a computerized information data base.

6. Describe, summarize and document all data, results, conclusions and recommendations resulting from the project.

2.5 PROJECT IMPLEMENTATION

2.5.1 General

The implementation of the Newfoundland pilot project basically comprised the scheduling of eight major components over a six (6) month period. The major components were as follows:

.1 Staff Orientation
.2 Auditor Selection and Training
.3 Procedure Development
.4 Testing and Experimentation
.5 Main Pilot Field Test
.6 Information Component
.7 Management Plan
.8 Deliverables

2.5.1 General (Cont'd)

In compliance with the terms of reference for the project the above components were executed in four distinct phases as described below. The original Activity Network Diagram (Figure 2.1) has been included for reference purposes.

2.5.2 Project Phases

.1 Phase I

Phase I was the familiarization period and period of program preparation. It included such activities as: project orientation, collection of housing data and preliminary housing stock review, initiation of mail survey, establishment of advisor and residence selection criteria, procedure review and commencement of procedure development, identification of retrofit options and available materials and skills, determination of course objectives and outline and review and initial design of household education package. Phase I extended from August 9 to September 10, 1982.

.2 Phase II

Phase II was the research, testing and development stage and included: analysis of mail panel survey and preparation of household report, completion of procedure development, field testing and refinement of procedure, selection of residences, selection of advisors, development of household education package, development of training program

2.5.2 Project Phases (Cont'd)

.2 Phase II (Cont'd)

and completion of all other miscellaneous items upon which the course delivery depended. Phase II extended from September 13 to October 8, 1982.

.3 Phase III

Phase III extended from October 12 to December 23 and basically included the delivery of the training course, testing and modifying as necessary of the household education package, implementation of the main pilot field test and evaluation of all of the above.

.4 Phase IV

Phase IV involved the preparation of the final report which consisted of a complete listing of all data, finding conclusions and recommendations resulting from the project.

2.6 PROJECT ORGANIZATION

2.6.1 General

To undertake the pilot project, a multi-disciplinary team of experienced professionals was assembled. The team had strong project management skills and were familiar with Newfoundland housing types, energy profiles and socio-economic characteristics as well as residential energy projects in other areas of Canada.

2.6.1 General (Cont'd)

The following is a list of the companies and organizations of which the project team consisted, complete with a brief explanatory description of each member's participation. Figures 2.2 and 2.3 indicate the organization of the project in terms of company and personnel involvement.

2.6.2 ShawMont Newfoundland Limited

As prime consultant in the project team, ShawMont Newfoundland Limited were responsible for the management and co-ordination of all aspects of the pilot project. As shown in Figure 2.3, the principle co-ordination roles (with the exception of the Training Course) were staffed by ShawMont personnel. All reporting and documentation to the Client was the responsibility of ShawMont staff, including the presentation at meetings on a regular basis.

ShawMont is a medium sized consulting company with a diverse and experienced background in project management and engineering in the energy resource field, both large and small scale. This experience was primarily geared to hydroelectric and thermal energy until 1978 when the concern for greater energy conservation requirements and the need for experienced engineering and project management consultants in energy fields became evident in Newfoundland. At this time, ShawMont began to actively build up expertise in

2.6.2 ShawMont Newfoundland Limited (Cont'd)

energy conservation and unconventional and renewable energy resources engineering and project management. By the end of 1979, the Company was one of the few firms to be pursuing this area of business in a major way. Since that time, ShawMont has steadily built up its expertise to become a fully experienced energy management company with the versatility and human resources to tackle projects, both large and small, effectively.

2.6.3 IBI Group

The IBI Group, with their extensive experience in residential energy management and building science, provided specialized assistance as required in all major components of the project.

The IBI Group, a national multi-disciplinary consulting firm, represents a unique combination of analytical disciplines and design skills offering a broad range of services from research and environmental assessment to project planning, design and construction management.

IBI Group in recent years has made energy management one of its prime areas for increased consulting activity.

2.6.4 College of Trades and Technology

The College of Trades and Technology, through its Extension Service, assisted in the development of the advisor training program and was responsible for the overall co-ordination and delivery of the training course.

The programs given in the College of Trades and Technology are designed to prepare people to enter employment and provide upgrading and re-training for those already in the work force. In fulfilling these functions, the College works in co-operation with the Canada Employment Centres to give training to adults who are referred under the Federal Occupational Training Agreements.

2.6.5 Saga Communications Limited

Saga Communications Limited were responsible for the development of basic communication concepts as well as the art work required for the homeowner information kit. Saga Communications Limited is Newfoundland's only full service advertising and public relations firm. It is a Newfoundland company and a fully accredited advertising agency with affiliations both nationally and internationally.

2.6.6 OMNIFACTS Research Limited

OMNIFACTS carried out a mail panel survey on the housing stock in the province, which provided a socio-economic profile of the province and indicated energy conservation awareness and attitudes.

2.6.6 OMNIFACTS Resreach Limited (Cont'd)

OMNIFACTS Research Limited, an associate company of Saga Communications provides a complete research capability in the fields of marketing, public opinion and socioeconomic survey.

2.6.7 MICRO-TECH

MICRO-TECH were responsible for providing specialized assistance in the development of the computer software as required throughout the program. MICRO-TECH is a Newfoundland owned and operated micro-computer retail and consulting company specializing in micro-computer system design.

2.6.8 Aiden Duff Contracting Limited

Mr. Aiden Duff provided assistance in the compiling of a complete list of possible retrofit options applicable to Newfoundland Housing Stock. He also provided the cost estimates which were used to determine the paybacks associated with the implementation of the pertinent retrofits. Mr. Duff, a well known local building contractor, specializes in older home renovations and retrofit work.

1982

AUG. | SEPT. | OCT. | NOV. | DEC.

PHASE I | PHASE II | PHASE III | PHAS

DEVELOP MAIL PANEL SURVEY

MAIL & RECEIVE QUESTIONNAIRE

REVIEW & ANALYSE MAIL PANEL SURVEY

COLLECT HOUSING STOCK DATA

REVIEW HOUSING STOCK

PRELIMINARY FINDINGS HOUSING STOCK

HOUSEHOLDER REPORT

SAMPLE HOUSE SELECTION

HOUSE SOLICITATION

HOUSE SELECTION

HOUSING SELECTION GUIDELINES

PRESSURE TESTING

HEAT LOSS CALCULATIONS

REVIEW ALTERNATE AUDIT PROCEDURES

PROCEDURE DEVELOPMENT

PROCEDURE MODIFICATIONS AS NECESSARY

CONCLUSION

PROCEDURE REVIEW

FURTHER SITE TESTING AND TRAINING AUDITS

CONCLUSIONS & ADVISORS EVALUATIONS

MAIN AUDIT PROGRAM

REVIEW RESULTS OF MAIN AUDIT

ORIENTATION PERIOD

CHRISTMAS BREAK

FINAL REPORT AND

IDENTIFY AND COST TYPICAL RETROFIT OPTIONS

HOUSEHOLD EDUCATION PACKAGE TESTING, MODIFICATION AND COMPLETION

DENTIFY AVAILABLE MATERIALS AND SKILLS

FINAL TRAINING PACKAGE

COURSE EVALUATION AND MODIFICATION

DEVELOPMENT OF HOUSEHOLD EDUCATION PACKAGE

INITIAL DESIGN OF THE HOUSEHOLD EDUCATION PACKAGE

DELIVERY OF AUDITOR TRAINING COURSE

DEVELOP AND MODIFY ADVISOR TRAINING PACKAGE

ESTABLISH COURSE OUTLINE

AUDIT STAFF SELECTION

REVIEW COURSE OBJECTIVES

AUDIT STAFF REQUIREMENT

DELIVERABLES

PHASE I △

- TRAINING COURSE OUTLINE
- HOUSE SELECTION CRITERIA
- PRELIMINARY FINDINGS — HOUSING STOCK ANALYSIS
- EXECUTIVE SUMMARY
- MID-PHASE REVIEW

PHASE II △

- DRAFT VERSION OF HOUSEHOLD EDUCATION PACKAGE
- DRAFT REPORT OF HOUSEHOLD SURVEY & HOUSING STOCK REPORT
- MID-PHASE REVIEW
- PHASE I REPORT

PHASE III A △

- AUDIT PROCEDURES - (COMPARABLE AUDIT TECHNIQUES)
- DEVELOPMENT OF NEWFOUNDLAND — SPECIFIC SUB-ROUTINES & CALCULATION METHODS
- PHASE II REPORT

PHASE III B △

- FINAL TRAINING PACKAGE INFORMATION
- MID-PHASE REVIEW

P
- FINAL
- PHAS
- ALL

ACTIVITY

NEWFOUN
HOME ENERGY

1982
PT.
OCT.
NOV.
PHASE II
PHASE III
QUESTIONNAIRE
REVIEW & ANALYSE MAIL PANEL SURVEY
HOUSEHOLDER REPORT
E SOLICITATION
HOUSE SELECTION
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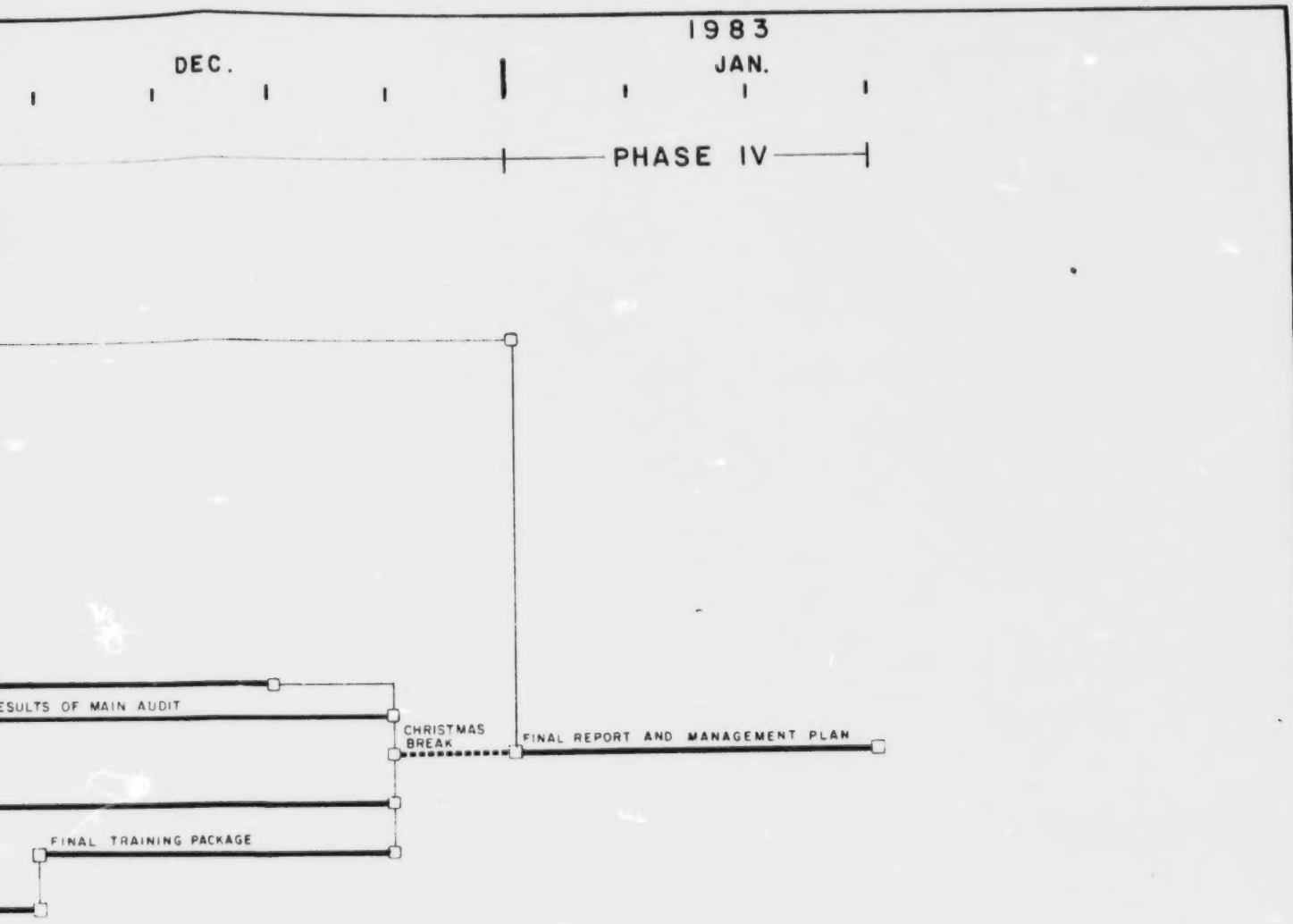
PROCEDURE MODIFICATIONS AS NECESSARY
CONCLUSION
FURTHER SITE TESTING AND TRAINING AUDITS
CONCLUSIONS & ADVISORS EVALUATIONS
MAIN AUDIT PROGR
REVIEW
HOUSEHOLD EDUCATION PACKAGE TESTING, MODIFICATION AND COMPLETION
ND SKILLS
COURSE EVALUATION AND MODIFICATION
LOPMENT OF HOUSEHOLD EDUCATION PACKAGE
DELIVERY OF AUDITOR TRAINING COURSE
LOP AND MODIFY ADVISOR TRAINING PACKAGE
AUDIT STAFF SELECTION
REMENT
DELIVERABLES
PHASE II
-DRAFT VERSION OF HOUSEHOLD EDUCATION PACKAGE
-DRAFT REPORT OF HOUSEHOLD SURVEY & HOUSING STOCK REPORT
-MID-PHASE REVIEW
-PHASE I REPORT
PHASE III A
- AUDIT PROCEDURES - (COMPARABLE AUDIT TECHNIQUES)
- DEVELOPMENT OF NEWFOUNDLAND - SPECIFIC SUB-ROUTINES & CALCULATION METHODS
-PHASE II REPORT



PHASE III B —— △

INAL TRAINING PACKAGE INFORMATION
MID-PHASE REVIEW

PHASE IV —— △

— FINAL REPORT
— PHASE III REPORT
— ALL OTHER DELIVERABLES

ACTIVITY NETWORK DIAGRAM

NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISORY PILOT PROJECT

FIGURE 2.1

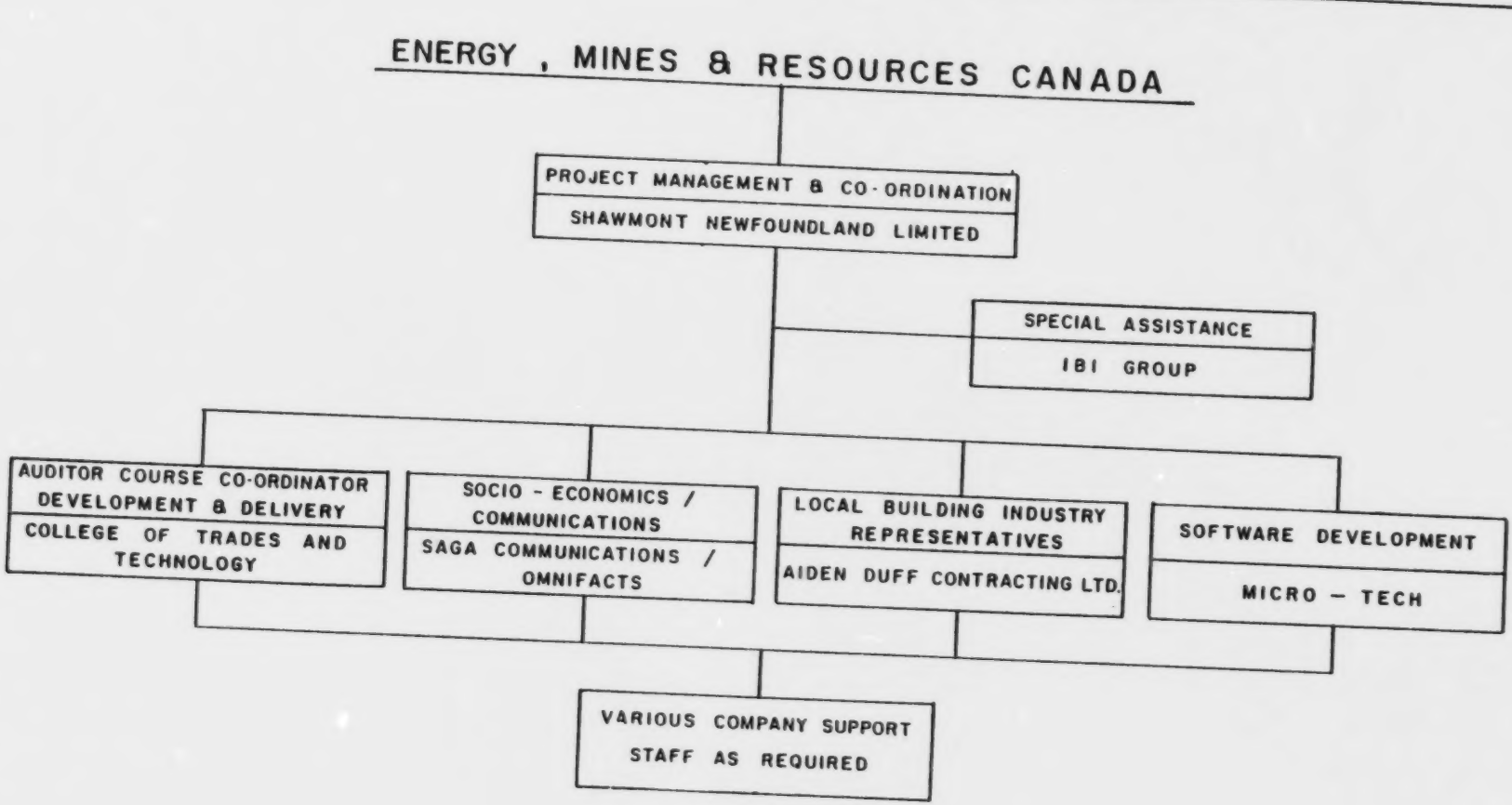

ENERGY , MINES & RESOURCES CANADA
PROJECT MANAGEMENT & CO-ORDINATION
SHAWMONT NEWFOUNDLAND LIMITED
SPECIAL ASSISTANCE
IBI GROUP
AUDITOR COURSE CO-ORDINATOR DEVELOPMENT & DELIVERY
COLLEGE OF TRADES AND TECHNOLOGY
SOCIO - ECONOMICS / COMMUNICATIONS
SAGA COMMUNICATIONS / OMNIFACTS
LOCAL BUILDING INDUSTRY REPRESENTATIVES
AIDEN DUFF CONTRACTING LTD.
SOFTWARE DEVELOPMENT
MICRO – TECH
VARIOUS COMPANY SUPPORT STAFF AS REQUIRED

FIGURE 2.2

COMPANY ORGANIZATION CHART

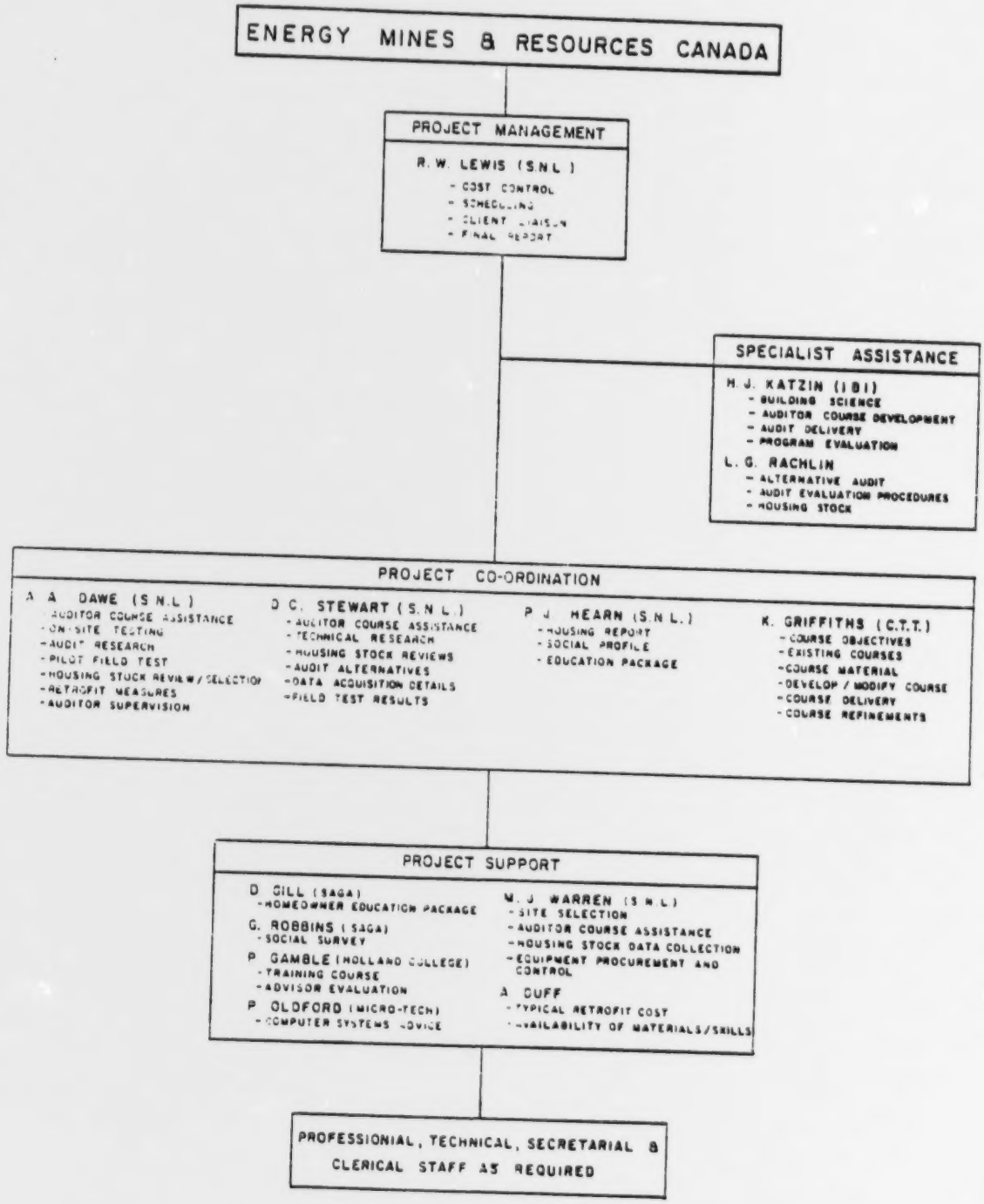


FIGURE 2.3

PERSONNEL ORGANIZATION CHART

ENERGY AUDIT – PILOT STUDY No 3

PART THREE

PROJECT COMPONENTS

PAGE

3.1 STAFF ORIENTATION

3.1.1 INTRODUCTION 3-1

3.1.2 PRINCE EDWARD ISLAND ORIENTATION SESSION 3-2

3.1.3 SUMMARY AND CONCLUSIONS 3-3

3.1.1 INTRODUCTION

Key individuals from all three pilot consultants in the respective ECAP regions were requested by Energy, Mines and Resources Canada to attend a two week orientation session in Prince Edward Island. The session which was organized by Audit Delivery Systems, the firm which carried out the P.E.I. pilot program, and Energy, Mines and Resources Canada, had three (3) main objectives:

- To provide background information on the evolution and history of the home energy advisory service.

- To provide a complete description of the planning, organization and implementation of the P.E.I. pilot project.

- To provide conclusions and recommendations, based on experience gained through both the development of the Millbank procedure and the P.E.I. pilot.

The orientation session in P.E.I. was considered to be a very important aspect of the pilot project and as such was made a requirement in the terms of reference issued for the project. In compliance with this requirement, arrangements were made to send six individuals from the Newfoundland Pilot project team. Each individual was required to concentrate on the areas which were directly related to work they would be carrying out in the Newfoundland Pilot.

3.1.2 PRINCE EDWARD ISLAND ORIENTATION SESSION

The orientation session took place at the Holland College Campus in Charlottetown, Prince Edward Island during the period between August 9th - August 20th, 1982. The session was structured in a training course format in which there were a series of lectures and workshops scheduled on a daily basis typically between the hours of 0830 and 1700. Appendix I contains a copy of the training schedule used during the session. As can be seen from the schedule, the mornings were used to present technical literature and lectures while the afternoons were used to participate in field audits. During the two week session participants were exposed to a wide range of topics. Lectures were given outlining the history and development of the Millbank Procedure and the subsequent evolution of the Prince Edward Island Pilot project which became known as ENERPLAN. A number of technical sessions dealt with such topics as heating systems analysis and heat loss calculations as well as economic evaluation techniques for energy conservation analysis. There were also a number of sessions which provided information to assist the other pilot consultants in:

- developing a training program;
- establishing trainee selection criteria;
- selecting equipment;
- modifying the ENERPLAN computer procedure; and
- managing the field program.

A number of workshops were held throughout the session which covered three main components:

3.1.2 PRINCE EDWARD ISLAND ORIENTATION SESSION (Cont'd)

-- Education Component, (ie. setting up a training program)
-- Technical Program (understanding the basic assumptions and algorithms used in the computer software)
-- Management Component (management considerations for the planning, organization and implementation of the respective pilots).

A number of opportunities were also provided to observe actual field audits during the course. Four of the advisors from the Prince Edward Island Pilot were used to teach participants the basic skills associated with carrying out a residential energy audit. During the initial audits, the participants were requested to observe, but as individuals became confident enough, they were encouraged to lead as many audits as could be accomodated in the schedule.

3.1.3 SUMMARY AND CONCLUSIONS

In general, it is the feeling of the project team that the staff orientation session met its objectives. Guest speakers from Millbank Associates, Energy, Mines and Resources Canada, and Audit Delivery Systems provided detailed, concise background information on the evolution of the residential energy advisory program and were available to answer questions from the participants. The session also identified potential problems which might be encountered in procedure development work as well as problems associated with individual project components. A number of priorities were also given for consideration during the planning and implementation stages of the respective pilots.

3.1.3 SUMMARY AND CONCLUSIONS (Cont'd)

In summary, the two weeks were invaluable in enabling the participants to grasp the scope of the pilot program. The hands-on involvement in the audits provided an excellent insight to the main goal of the program - that of increasing homeowner awareness of the energy conservation potential of his home. If any criticism could be laid during the two weeks it would chiefly be in three areas:

- The lack of printed information to back up what was discussed in the classroom session,

- A breakdown in the schedule of events from Tuesday of the second week,

- The lack of resource material made available to the individuals responsible for the development of the training course in the respective pilot projects.

3.2 EQUIPMENT PROCUREMENT AND DESCRIPTION

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	.3 Smoke Tester	3-10
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	.6 Measuring Tape	3-11
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3.2.1 SPECIFICATION AND PURCHASE

During the Prince Edward Island orientation session, a listing of all equipment was provided to each of the pilot projects. The list contained model numbers and the names of companies from which the equipment could be purchased. With the exception of the micro computer, the furnace efficiency test kit and the smoke tester, all other equipment was considered to be standard and readily available through local suppliers in the respective ECAP regions. Based on the performance of the Dedesco Furnace Efficiency Tester and the Bacharach Smoke Tester during the Prince Edward Island Pilot, a decision was made to use the same equipment in the Newfoundland Pilot Project. With respect to the microcomputer however, a market survey was carried out to identify and compare the various types of micro-computers which could be used in the project. As a result of this market search, a decision was made to purchase a KayComp computer rather than the Osbourne computer used in the Prince Edward Island Pilot Project. The following are the main reasons why the KayComp was selected over the Osbourne:

-- The 9 inch screen on the KayComp computer was superior to the 5.5 inch screen available on the Osbourne in terms of information, display character recognition time, and less user eye strain.

-- Double density discs can be used with the KayComp which increases the unit's capability as a data base management system.

3.2.1 SPECIFICATION AND PURCHASE (Cont'd)

-- Local service and software development support was readily available for the KayComp system.

-- Given that both units were similar in price the KayComp was rated higher for the required application.

A complete list of all equipment during the project along with the associated costs can be found in Table 3.2.1.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE

The following section contains an evaluation of the individual pieces of equipment used during the Newfoundland Pilot Study.

.1 Computer

The KayComp II computer proved to be a rugged, durable instrument which performed quite well throughout the project. During the orientation and training phases there were a few minor malfunctions which were easily rectified by the local supplier. There was only one instance where the machine failed during a survey. The machine was set up too close to a wood stove thus causing an overheating condition. After cooling down, the machine worked normally and no other problems were experienced.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.1 Computer (Cont'd)

Many of the homes surveyed were not equipped with three pronged plug outlets as required by the computer. This problem was overcome by using an extension cord with the machine. Although this solution is not ideal in terms of user safety no problems arose or were anticipated to arise.

The fact that the KayComp requires a vinyl cover to protect it from the elements was originally thought to be a disadvantage. However during the main pilot, the cover provided the advisor with extra space to carry handout literature and also served as a mat to protect kitchen tables from possible scratches by the computer.

.2 Furnace Efficiency Tester

The Dedesco Furnace Efficiency Tester worked quite well throughout the life of the program. It was found that as long as the tester was operated in accordance with the manufacturers instructions and was properly maintained (eg. batteries charged and calcium sulphate granules kept fresh) it remained problem free. To assist the advisors in becoming familiar with the operation of the unit, the instruction manual was reduced and attached to the inside of the cover on each unit.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.2 Furnace Efficiency Tester (Cont'd)

Unlike the Prince Edward Island Pilot study, where the furnace tester was located inside the advisors attaché case, the unit was left in its original case in the Newfoundland Pilot study. This was done for the following reasons:

- In Newfoundland, unlike Prince Edward Island, many houses are electrically heated hence the tester was not required for every survey. By keeping the unit in a separate case the amount of equipment which had to be carried by the advisor was reduced and subsequently the risk of damage to the unit was also lessened.

- Removing the unit from its original case may cause the manufacturers warranty to be voided.

- When removing the tester from its case in order to place it in the attaché case there is potential risk of damage. In one instance where one of the units was removed it short circuited and had to be returned to the manufacturer for repairs. The unit was repaired quickly and returned within 5 days. As it turned out the unit was found to have a defective battery retainer.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.2 Furnace Efficiency Tester (Cont'd)

- Since in most, if not all cases, the furnace was located in the basement it was more convenient to use the tester as an individual unit from its own case rather than having it contained in the attaché case.

.3 Smoke Tester

The Bacharach Smoke Tester operated very efficiently throughout the project. There were only two problems which were indirectly related to this piece of equipment. The first concerned the supplier, Kerr Controls, who required a seven week delivery period for the equipment. Although this did not seriously delay the project it did cause minor problems during the orientation and training phases of the study as trainees were unable to obtain smoke numbers when carrying out furnace efficiency tests. The second problem resulted from a tendancy, on several occassions, for the advisor to leave the reference card behind. Since the card was an important component in the Bacharach System it meant that time was lost returning to a home to retrieve it. Two of these cards had been lost by the end of the study.

.4 Thermometer

The Digital Thermometer performed well during the pilot project with no problems encountered.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.5 Compass

The Silva Huntsman Compass was used without any problems.

.6 Measuring Tape

There were no problems with the Stanley 7.5 metre measuring tape after the advisors had become accustomed to measuring in metric.

.7 Flue Punch/Hand Drill/Electric Drill

Initially a hand punch was provided with the advisor kits to punch a hole in the flue pipe for the smoke tester and the probe from the furnace efficiency tester. The punch was used on several occasions with little or no satisfaction. Some concern was also expressed with respect to possible damage to the stack switch which may result from the hammering action associated with the hand punch technique. Alternate attempts to place holes in the flue pipe by using hand drills were equally unsatisfactory. Both the hand punch and the hand drill proved to be a time consuming and frustrating experience when trying to puncture the metal wall of the furnace flue pipe. Eventually the problem was overcome by using a Black and Decker electric drill with a 5/16", high speed drill bit. The electric drills worked without any problems during the remainder of the pilot study.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.8 Camera

The Kodamatic 920 Instant Camera worked well during surveys conducted on the Island (ie. St. John's, Petty Harbour, and Gander sites). There were a few problems with exposure until the advisors became familiar with proper camera settings. The camera proved to be unuseable for the survey of houses in Happy Valley - Goose Bay. This was caused by two problems, the first being the unavailability of film and the second being the malfunctioning of the camera when exposed to extreme cold conditions (around -20°C).

.9 Screwdriver

The 6 bit interchangeable head screwdriver worked very well during the study.

.10 Flashlights

It proved very effective to have two flashlights as part of the kit. The large pivoting head flashlight was ideal for use in crawl spaces and attics while the small pocket light was perfect for use around the furnace and around sectional boxes (when checking for insulation).

.11 Stepladder

The two step ladders purchased for the project were rarely required. When they were used, their heights (5 ft., and 6 ft.) were adequate both in terms of use and transportation to the survey home.

3.2.2 EQUIPMENT EVALUATION AND PERFORMANCE (Cont'd)

.12 Crochet Hook

The use of plastic crochet hooks provided a reasonable means of determining the presence and type of insulation. The hooks worked only when there was adequate space around the sectional boxes. In a number of cases such space was not available and time was lost looking for sectional boxes to perform insulation checks.

.13 Attaché Case

The five inch attaché case, fitted with foam, was ideal for use in transporting and protecting equipment. It should be noted that the Samsonite cases proved to be far superior to the Jetliner cases used during the study. In fact, both Jetliner cases had faulty latching mechanisms, one of which had to be returned and replaced with a Samsonite case.

3.2.3 RECOMMENDATIONS

The following recommendations for equipment specification and use have been made based on experience gained through the implementation of the Newfoundland Pilot Study. The recommendations have been provided for consideration during the planning stage of an audit program.

1. Based on experience gained through use of both the Obsourne and KayComp micro-computers, serious consideration should be given to selecting a microcomputer which has the operation charac-

3.2.3 RECOMMENDATION (Cont'd)

1. (Cont'd)

teristics similar to the KayComp. The nine inch screen was found to be very useful in terms of inputing and displaying data while the double density discs had a number of definite advantages for a data base management system. The most important criteria which should be considered when selecting a microcomputer is the availability of local support and servicing for the system.

2. To minimize the possibility of damage and voiding of the manufacturers warranty, equipment such as the Dedesco Furnace Efficiency Tester should not be removed from its original carrying case.

3. A two month delivery date for equipment such as the micro-computer, the Dedesco Furnace Efficiency Tester and the Bacharach Smoke Tester should be considered when initially ordering equipment.

4. Consideration should be given to using an electric drill (as opposed to a hand punch or hand drill) to produce the test hole required in the furnace flue pipe. Ideally it would be best to use cordless drills but the added expense may not justify their use.

5. When arrangements are being made to carry out surveys in remote or isolated areas, consideration should be given to the availability of supplies such as batteries and camera film.

3.2.3 RECOMMENDATIONS (Cont'd)

6. When surveying homes during extreme cold conditions, equipment should always be kept warm as much as possible to prolong battery life. The equipment should never be left overnight in an unheated area such as a car.

7. Due to problems experienced with cheaper brand name products, it is recommended that a five inch Samsonite attaché case or equivalent be used as an equipment case for the energy advisor.

TABLE 3.2.1

ADVISORS EQUIPMENT LIST

Item	Model No. (if applicable)	Manufacturer	Supplier	Cost (approximate)	Number Purchased
Computer	Kay Pro II	Non Linear Systems	Micro-Tech Ltd.	$3,000.00	4
Furnace Efficiency Tester	B	RAB Dedesco	RAB Dedesco	1,200.00	4
Digital Thermometer	M-99	Electro-Therm Ltd.	Heathkit	110.00	4
Smoke Tester	True-Spot	Bacharach	Kerr Controls	100.00	4
Attaché Case	5"	Samsonite	Consumers Distributing	70.00	4
Step Ladder	5' & 6'	Canadian Tire Corp.	Canadian Tire Corp.	40.00	2
Instant Camera	920	Kodak	Tooton's Limited	30.00	4
Electric Drill	--	Black and Decker	Canadian Tire Corp.	25.00	2
Tape Measure	7.5 m	Stanley	Woolco	17.50	4
Lantern	LMGSP	Everready	Woolco	15.00	4
Compass	--	Silva	Canadian Tire Corp.	15.00	4
Multi Head Screwdriver	6 Bits	--	Local	6.00	4
Extension Cord	10'	--	Local	4.00	4
Pocket Flashlight	--	--	Woolco	4.00	4
Afgan Hook	--	--	Woolco	1.00	4
TOTAL				$4,637.50	

3.3 HOUSING STOCK ANALYSIS

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3.3.1 INTRODUCTION

An initial element of the Newfoundland Pilot Project was the completion of a detailed housing stock analysis for the province. The analysis consisted of two research phases involving the collection of all published statistics on the provincial housing stock and a mail panel survey (Described in Section 3.4) consisting of 1300 households representative of the population of Newfoundland and Labrador in terms of geographic region, age, family income, household size and level of education.

The two phases were compared in order to determine the extent of correlation between the two analyses. The comparison assisted in the verification of the criteria used to select homes during the main pilot. It was attempted to obtain a typical cross-section of provincial housing stock for surveying in the main pilot field study.

Data collection associated with the housing stock analysis commenced on project award. Data was collected from the following sources:

- Energy, Mines and Resources Canada (Ottawa and St. John's),
- Canada Mortgage and Housing Corporation
- Newfoundland and Labrador Housing Corporation
- Provincial Department of Mines and Energy
- Statistics Canada
- Newfoundland Light and Power Company Limited
- City of St. John's

3.3.2 ANALYSIS OF PUBLISHED STATISTICS

The method used for the analysis of published statistics focused on dwelling type, age, space heating equipment type and energy type for space heating, as these were considered to be the primary criteria for the selection of dwellings for the pilot project.

.1 Overview of Housing Stock Today

The current housing stock in Newfoundland totals 149,000 households (as of June, 1981), and is made up of predominantly single detached dwellings (81%). The remainder is composed of single attached dwellings (7 - 8%) and apartments (11 - 12%). Table 3.3.1 documents the types of dwelling unit in Newfoundland 1951-1981. As of 1981, over half (55%) of the dwellings in Newfoundland were reported to have been built after 1959 (see Table 3.3.2). The rest of the housing stock was built either between 1940 and 1959 (26%) or before 1940 (19%).

The only available indicator of dwelling size is the number of rooms per dwelling. In 1981, the majority of dwellings had five (22%), six (29%), seven (17.4%) and eight (11%), rooms per dwelling. Table 3.3.3 shows the number of rooms per dwelling for Newfoundland, 1953 - 1981.

The predominant types of heating equipment found in the current housing stock are electricity (34%) (either baseboard or radiant heating), forced hot air combustion furnaces (27%) and steam or hot water combustion furnaces (14%). The three principal heat-

3.3.2 ANALYSIS OF PUBLISHED STATISTICS (Cont'd)

.1 Overview of Housing Stock Today (Cont'd)

ing fuels in the province are oil or other liquid gas (e.g. propane) (52%), electricity (35%), and wood (12%). (See Tables 3.3.4 and 3.3.5 respectively).

.2 Characteristics of St. John's Housing Stock

Table 3.3.6 shows the distribution of St. John's housing stock by age band. The stock is distributed fairly evenly among the age bands with the largest number of dwellings in the 1971 - 1980 category (28%). The proportion of dwellings in the four age bands is similar for both St. John's and the province as a whole.

The housing stock of St. John's (Census Metropolitan Area) amounts to 43,295 dwellings (1981) or, approximately 30% of total dwellings in the province (see Table 3.3.7). Single detached dwellings are the predominant type comprising 63% of the total. The proportion of single attached dwellings in St. John's (18%) is nearly twice that of the province (10%). In addition, the proportion of apartments and duplexes in St. John's (16%) is twice the provincial share (8%). These differences are typical of an urban area where apartments and attached housing are more commonly found.

3.3.3 COMPARISON OF PUBLISHED STATISTICS AND SOCIAL SURVEY RESULTS

To assist in further validating the type of data collected, the analysis of published statistics was compared with analysis of that social survey data which was relevant to housing stock characteristics. The following is a summary of the major cross tabulations.

.1 Housing Types

It was determined from the Census data that the predominant housing type in Newfoundland was the single detached dwelling accounting for 81% of the total housing stock. In the mail panel analysis, 85.5% of the total sample consisted of single detached dwellings (see Table 3.3.8).

.2 Housing Type by Age Band

Housing stock by age band was analyzed in the mail panel survey and the results are comparable to the Census analysis. According to the Census, 55% of the dwellings in Newfoundland were built after 1959. The mail panel analysis reports that 59.3% of all dwellings included in the sample were built after 1960. In the Census analysis, the remainder of the housing stock was built either between 1940-1959 (26% compared with 22.5% between 1945-1960 in the mail panel analysis), and before 1940 (19% in the Census analysis compared with 18.2% built before 1945 in the mail panel analysis). In addition, the mail panel analysis determined that dwelling types were distributed in age bands as indicated in Table 3.3.9.

3.3.3 COMPARISON OF PUBLISHED STATISTICS AND SOCIAL SURVEY RESULTS (Cont'd)

.3 Dwelling Size

In the Census analysis, the only indicator of dwelling size was the number of rooms per dwelling. In 1981, the majority of dwellings had five (22%), six (29%), seven (17%) and eight (11%), rooms per dwelling. The results of the mail panel analysis indicate that the majority of dwellings in the sample have four or less (11%), five (22%), six (31%) and seven 18%) rooms per dwelling (Table 3.3.10). These findings are very similar to the Census findings and therefore support the previous analysis.

The mail panel analysis also provided figures on the number of rooms and the housing type by square feet of living space (Tables 3.3.11 and 3.3.12). As might be expected, single detached dwellings have the largest number of rooms while "other" dwelling types contain the smallest number of rooms. The largest percentage of single detached dwellings (43.7%) are sized between 900 - 1200 square feet while the largest percentage of "other" dwellings (42.5%) are sized less than 900 square feet.

.4 Heating Systems

In the Census analysis, the predominant types of heating equipment were: electricity (34% - either baseboard or radiant heating), forced air combustion furnaces (27%) and steam or hot water combustion

3.3.3 COMPARISON OF PUBLISHED STATISTICS AND SOCIAL SURVEY RESULTS (Cont'd)

.4 Heating Systems (Cont'd)

furnaces (14%). These findings can be compared in part with the mail panel analysis which determined that the predominant types were, electric baseboard (29.5%), electric furnace (hot water or forced air 1.2% each), oil furnace (hot water 12.9%), oil furnace (forced air 18.1%), oil stove (3.6%), wood stove (18.3%), wood furnace (6.4%) and combinations of the above types (8.8%). (See Table 3.3.13).

3.3.4 CONCLUSIONS

As outlined above, there appears to be a high correlation between Census data obtained from published statistics and the data obtained from the Social Survey.

The comparative analysis suggests additional factors for the designing of dwelling selection for the future audit program for Newfoundland. These factors are:

- one storey, single family detached dwellings should dominate;
- dwelling size is generally less than 1200 square feet, comprising five to seven rooms;
- heating equipment primarily consists of forced air combustion furnaces and electric baseboard heating;
- slightly over one half of the heating equipment uses oil or other liquid fuel with slightly over one-third using electricity,
- wood fuel systems account for a considerable segment of the heating equipment. This segment would increase per capita in communities close to wood resources and would have to be accounted for in the technical program.

TABLE 3.3.1

HOUSING STOCK BY TYPE, NEWFOUNDLAND

(000's)

YEAR	TOTAL HOUSEHOLDS	DWELLING TYPE					
		SINGLE DETACHED	%	SINGLE ATTACHED	%	APARTMENT OR FLAT	%
1951	71	59	83.1	7	9.9	4	5.6
1961	88	75	85.2	9	10.2	4	4.5
1971	110	88	80.0	12	10.9	10	9.1
1981	149	121	81.2	11	7.4	17	11.4

Source: Statistics Canada

TABLE 3.3.2

HOUSEHOLD SHOWING THE PERIOD OF CONSTRUCTION OF THE DWELLING, NEWFOUNDLAND, 1975 - 1981

(000's)

YEAR	TOTAL HOUSEHOLDS	PERIOD OF CONSTRUCTION					
		BEFORE 1940	%	1940-1959	%	1960 & AFTER	%
1975	125	34	27.2	39	31.2	53	42.4
1976	130	28	21.5	40	30.8	63	48.5
1977	135	26	19.3	39	28.9	70	51.9
1978	137	29	21.2	40	29.2	67	48.9
1979	140	31	22.1	41	29.3	68	48.6
1980	144	31	21.5	36	25.0	77	53.5
1981	149	28	18.8	39	26.2	82	55.0

SOURCE: Statistics Canada (#64-202)

TABLE 3.3.3

ROOMS PER DWELLING, NEWFOUNDLAND

(000's)

YEAR	TOTAL DWELLINGS	NUMBER OF ROOMS PER DWELLING																	
		1	2		3		4		5		6		7		8		9+		
			#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	
1953	79	--	4	5.1	5	6.3	11	13.9	17	21.5	21	26.6	10	12.7	6	7.6	--		
1961	88	--	--		6	6.8	9	10.2	24	27.3	21	23.9	14	15.9	7	8.0	5	5.7	
1971	110	--	--		5	4.5	13	11.8	31	28.2	30	27.3	18	16.4	7	6.4	5	4.5	
1981	149	--	--		6	4.0	14	9.4	33	22.1	43	28.9	26	17.4	16	10.7	10	6.7	

SOURCE: Statistics Canada

TABLE 3.3.4

PRINCIPAL HEATING EQUIPMENT, NEWFOUNDLAND

ALL DWELLINGS

(000's)

YEAR	TOTAL HOUSEHOLDS	FURNACES						HEATING STOVES	%	ELECTRICITY	%	COOK STOVES	%	OTHER	%
		STEAM OR HOT WATER	%	HOT AIR											
				FORCED	%	OTHER	%								
1951	75	--	--	--	--	--	--	16	21.3	--	--	54	72.0	--	--
1961	88	4	4.5	7	8.0	5	5.7	19	21.6	--	--	53	60.2	--	--
1971	110	18	16.4	30	27.3	8	7.3	24	21.8	--	--	28	25.5	--	--
1981	149	21	14.1	40	26.8	--	--	18	12.1	51	34.2	13	8.7	--	--

SOURCE: Statistics Canada (#64-202)

TABLE 3.3.5

PRINCIPAL HEATING FUEL, NEWFOUNDLAND

(000's)

YEAR	TOTAL HOUSEHOLDS	OIL OR OTHER LIQUID	%	PIPED GAS	%	BOTTLED GAS	%	ELECTRI-CITY	%	COAL OR COKE	%	WOOD	%	OTHER	%
1951	75	--	--	--	--	--	--	--	--	27	36.0	38	50.7	--	--
1961	88	31	35.2	--	--	--	--	--	--	24	27.3	33	37.5	--	--
1971	110	94	85.5	--	--	--	--	--	--	--	--	10	9.1	--	--
1981	149	78	52.3	--	--	--	--	52	34.9	--	--	18	12.1	--	--

SOURCE: Statistics Canada (#64-202)

TABLE 3.3.6

HOUSING STOCK BY AGE, ST. JOHN'S CMA AND NEWFOUNDLAND

PERIOD OF CONSTRUCTION	CMA NO.	CMA %[1]	NEWFOUNDLAND NO.	NEWFOUNDLAND %[2]
Pre-1946	10,710	25.9	38,240	25.7
1946-1960	9,545	23.1	40,110	26.9
1960-1971	9,380	22.7	31,095	20.9
1971-1980	11,765	28.4	39,555	26.5

1 Annual Summary of Planning Data and Activities - City of St. John's Planning Department (1981).

2 Canada Housing Heating Performance and Improvability - Scanada Consultants Limited (1979).

TABLE 3.3.7

DWELLINGS BY STRUCTURAL TYPE, 1981

CHARACTERISTICS	NEWFOUNDLAND	%	ST. JOHN'S CMA	%
Occupied Private Dwellings	148,420		43,295	
Owned	119,695	80.6	30,100	69.5
Rented	28,725	19.4	13,210	30.5
Single Detached	116,495	78.5	27,385	63.3
Single Attached	14,660	9.9	7,890	18.2
Apartment 5+ Storeys	870	.59	600	1.4
Apartment 5 storeys	7,705	5.2	4,425	10.2
Duplex	3,825	2.6	2,235	5.2

SOURCE: Statistics Canada (E-559).

TABLE 3.3.8

HOUSING STOCK BY TYPE (MAIL PANEL)

	SINGLE DETACHED (n=875) %	OTHER (n=148) %
TOTAL SAMPLE (n = 1023)	85.5	14.5
One Storey (n = 629)	92.4	7.6
Two Storey (n = 251)	69.7	30.3
Other (n = 143)	83.2	16.8

TABLE 3.3.9

PERCENTAGE OF THE VARIOUS HOUSING TYPES IN THE SAMPLE BY AGE BAND (Mail Panel)

	BEFORE 1945 %	1945-1960 %	1961-1970 %	AFTER 1970 %
TOTAL SAMPLE (n = 1004)	17.9	22.2	22.7	37.2
Single Detached (n = 865)	17.3	23.6	22.8	36.3
Other (n = 139)	21.6	13.7	22.3	42.4

TABLE 3.3.10

NUMBER OF ROOMS PER DWELLING UNIT (Mail Panel)

NUMBER OF ROOMS	DWELLINGS	PERCENTAGE
4 or less	107	10.6
5	225	22.2
6	311	30.7
7	182	18.0
8	94	9.3
9 or more	94	9.3

TABLE 3.3.11

NUMBER OF ROOMS BY HOUSING TYPE (Mail Panel)

	SINGLE DETACHED %	OTHER %
TOTAL SAMPLE (n = 1013)	85.4	14.6
4 or less (n = 107)	78.5	21.5
5 rooms (n = 225)	80.9	19.1
6 rooms (n = 311)	84.6	15.4
7 rooms (n = 182)	89.0	11.0
8 rooms (n = 94)	92.6	7.4
9 or more (n = 94)	92.6	7.4

TABLE 3.3.12

HOUSING TYPE BY SQUARE FEET OF LIVING SPACE (Mail Panel)

	TOTAL SAMPLE (n=922)	LESS THAN 900 (n=302)	900-1200 (n=388	1201-1500 (n=125)	MORE THAN 1500 (N=107)
SINGLE DETACHED %		31.3	43.7	13.7	11.3
OTHER %		42.5	31.2	12.7	13.6

TABLE 3.3.13

PRINCIPLE HEATING SOURCE

BY PERCENTAGE OF THE SAMPLE (Mail Panel)

(n = 1018)

	PERCENTAGE
Electric - Electric Baseboard	29.5
- Electric Furnace (Hot Water)	1.2
- Electric Furnace (Warm Air)	1.2
Oil Furnace (Hot Water)	12.9
Oil Furnace (Warm Air)	18.1
Oil Stove	3.6
Wood Stove	18.3
Wood Furnace	6.4
Combinations of Above	8.8

3.4 SOCIAL SURVEY

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3.4.1 INTRODUCTION

To supplement the research and analysis on housing stock and to provide a socio-economic profile of households in the Province of Newfoundland and Labrador, a survey was conducted using statistically proven techniques. The profile was established using information obtained from a consumer mail panel developed by Omnifacts Limited of St. John's. Use of the mail panel permitted the collection of information on awareness levels, attitudes towards energy conservation, likely take-up rate of government programs and other relevant data representative of the Province as a whole. The mail panel consists of approximately 1300 households which have been selected at random from the most recent provincial list of electors. The panel members have been selected in such a manner to ensure that the sample is totally representative of the provincial population in terms of: geographic region, age, family income, household size and level of education. With a response rate of 80% or more and a resulting sample of approximately 1,000 households, there is a 95% level of confidence that the data obtained are within 3% of true population statistics.

For this survey, 1382 questionnaires were mailed out to panel members and 1044 of these were returned by the cut-off date for a participation rate of 75%. The survey produced a great deal of information, much of which was too extensive to do a complete cross tabulation. Therefore, only selected cross tabulations were attempted to meet the immediate needs of this program. No multiple cross tabulation analyses were attempted.

3.4.1 INTRODUCTION (Cont'd)

The questionnaire frequency analysis and cross tabulation analyses are located in Appendix IV.

3.4.2 GOVERNMENT ASSISTANCE PROGRAMS

.1 Participation Rates - Canadian Home Insulation Program and the Canada Oil Substitution Program

Over half the respondents (54.4%) have taken part in CHIP while only 7.6% of the respondents having applied for COSP. Table 3.4.1 below gives a breakdown of the historic take-up rates by program for each income level. The figures indicate that the CHIP program is favoured by lower income groups. This is probably due to the less attractive incentives available to family incomes having higher marginal tax rates. The take-up rate for COSP is still too small to make any comment except that, to date, take-up is not related to particular income levels.

Table 3.4.1

Extent of Participation in CHIP and COSP

		CHIP			COSP	
		Yes	No		Yes	No
Total Sample	(n=1021)	54%	46%	(n=1009)	8%	92%
< $14,000	(n= 452)	62%	38%	(n= 435)	8%	92%
$14,000-$25,999	(n=351)	49%	50%	(n= 364)	8%	92%
> $26,000	(n= 218)	47%	53%	(n= 210)	8%	92%

3.4.2 GOVERNMENT ASSISTANCE PROGRAMS (Cont'd)

.2 Future Take-Up Considerations

In terms of future take-up of COSP and CHIP, the 45.6% of the respondents who had not received a grant from CHIP indicated the following reasons for non-application:

		%
a.	Already well insulated	24.3
b.	No knowledge of program	13.3
c.	Too expensive	11.6
d.	Do not know how to apply	10.4
e.	Renting	10.1
f.	Other	10.1
g.	Not eligible	8.1
h.	Not interested	6.7
i.	Applying now	5.4
	(n = 425)	100

If items a, g, h, i are removed from the sample (44.5%), the potential for take-up, based on sample responses, is approximately 22% of the total sample. To reach these potential CHIP recipients, it may be necessary to supply additional information on how to apply, gear an approach to landlords, as well as other factors and information on why CHIP is too expensive.

In terms of take-up for COSP, 92.4% of the sample have never received a grant from this program. Of those respondents not having received a grant the following was the frequency of reasons:

3.4.2 GOVERNMENT ASSISTANCE PROGRAMS (Cont'd)

.2 Future Take-Up Considerations (Cont'd)

		%
a.	No knowledge of program	33.9
b.	Other	13.4
c.	Too expensive	12.9
d.	Not eligible	10.4
e.	Not interested	9.3
f.	Do not know how to apply	8.7
g.	Already have wood	6.0
h.	Retiring	4.0
i.	No facilities for wood stove/no wood	1.4
	(n = 843)	100

If items d and e are removed (19.7%), the potential take-up rate, based on the sample responses, is significant (67% of the total sample not having applied for the COSP grant) such that a further public awareness program might increase take-up in the future.

Recipients of CHIP grants were also asked if they would consider taking advantage of CHIP and/or COSP. 45% of the respondents (n = 433) stated that they would consider it (Table 3.4.2). The same question was asked of COSP recipients, but the sample size is too small to make any observations.

The future take-up potential would appear to be geared to both COSP and CHIP recipients who can either take advantage of remaining CHIP monies or of the COSP program.

3.4.2 GOVERNMENT ASSISTANCE PROGRAMS (Cont'd)

.2 Future Take-up Considerations (Cont'd)

Table 3.4.2

Consideration of taking up other programs (CHIP and/or COSP) by recipients of CHIP and COSP Grants

		Recipients of CHIP			Recipients of COSP	
		Yes	No		Yes	No
Total Sample	(n=433)	45%	55%	(n=51)	51%	49%
< $14,000	(n=197)	47%	53%	(n=21)	48%	52%
$14,000-$25,999	(n=141)	42%	58%	(n=19)	58%	42%
> $26,000	(n= 95)	45%	55%	(n= 11)	46%	55%

3.4.3 FUNDING EXPECTATIONS AND REQUIREMENTS

The following three sub-sections indicate the respondents views on CHIP and COSP grants, funding requirements for energy efficiency and perceived acceptable paybacks from energy retrofits.

.1 Sufficiency of Available Grants - CHIP & COSP

When asked whether CHIP and COSP grants were sufficient to reduce their home energy costs significantly, the majority of respondents stated that they were not sure (52%). Table 3.4.3 indicates the respondents perception of funding adequacy

3.4.3 FUNDING EXPECTATIONS AND REQUIREMENTS (Cont'd)

.1 Sufficiency of Available Grants - CHIP & COSP

byincome level category. In the higher income category, there appears to be slightly more dissatisfaction with funding levels than with the other income levels. The large response of 'not sure' indicates a lack of knowledge either of the grants that are available or of the costs of energy construction retrofit work.

Table 3.4.3

Adequacy of Funding CHIP and COSP

		Adequate %	Not Adequate %	Not Sure %
Total Sample	(n=925)	36	12	52
< $14,000	(n=374)	37	8	55
$14,000-$25,999	(n=358)	36	11	53
> $26,000	(n=243)	33	22	45

.2 Funding Required to Bring Home to Acceptable Level of Energy Efficiency

Figure 3.4.1 (end of section) illustrates the respondents perceived extent of funding to bring their homes to an acceptable level of energy efficiency. Over half (53.2%) of the respondents felt that in excess of $1,000 would be required to bring their home to this level. 23.4% of the respondents felt that more than $2,500 would be required. There appears to be a inordinately high

3.4.3 FUNDING EXPECTATIONS AND REQUIREMENTS (Cont'd)

.2 Funding Required to Bring Home to Acceptable Level of Energy Efficiency (Cont'd)

proportion of newer homes (built after 1970) in the $2,500 and over category.

.3 Acceptable Payback Period

The majority of respondents (58.2%) considered two to five years acceptable for retrofit payback. This is reflected in all income levels (Table 3.4.4).

Table 3.4.4

Length of Time Considered Acceptable for Retrofit

		2 Yrs %	2-5 Yrs %	6-7 Yrs %	8-10 Yrs %
Total Sample	(n=881)	24	58	9	9
< $14,000	(n=335)	25	58	8	10
$14,000-$25,999	(n=321)	23	62	10	6
> $26,000	(n=225)	24	55	9	12

3.4.4 AWARENESS OF ENERGY CONSERVATION PRACTICES AND MEASURES

A list of twenty possible energy conservation measures was included on the mail panel questionnaire and respondents were asked which measures they had already done, considered doing or did not understand.

3.4.4 AWARENESS OF ENERGY CONSERVATION PRACTICES AND MEASURES (Cont'd)

.1 Measures "Already Done"

Figure 3.4.2 illustrates the responses to each measure in terms of awareness. If the "already done" category is taken as an indicator of awareness of energy conservation practices, it is clear that, for the most part, the sample respondents have a good awareness for the most common practices. In terms of awareness levels by income, the data did not indicate any significant difference between the levels with the exception of the furnace tune-up category which had been "already done" by a high proportion of respondents in the less than $26,000 income level.

.2 Measures "Would Consider"

The conservation measures which respondents "would consider" most often were: "install hot water flow restrictors (63.6%), install domestic solar hot water system (45.4%) and close off portions of the home not in use during the heating season (42.1%)".

.3 Measures "Not Understood"

Conservation measures most often "not understood" were: install domestic solar hot water system (50.8%), install hot water flow restrictors (23.7%), and ensure freezer full to operate efficiently (17.4%). It is significant that two of the conservation measures that respondents would consider - install hot water flow restrictors and install domestic solar hot water systems - are also two of the measures most often "not understood".

3.4.5 ATTITUDES TOWARDS ENERGY CONSERVATION

The sample was asked to reply to a series of statements on energy conservation as to whether they agreed, disagreed or were neutral (neither agreed nor disagreed) with each statement. The data was cross tabulated by income levels but, as in other cases, there was no anomalies to indicate that income level grouping had any significant effect on energy conservation attitudes. Table 3.4.5 indicates the distribution of attitude toward the various statements presented. Statements a, b, c, f and h indicate statement agreements in excess of 80% of the sample. These statements require agreement to register a positive attitude to energy conservation (although people with Urea-Formaldehyde Foam Insulation (UFFI) might dispute b). Statements requiring disagreement to show a positive attitude towards energy conservation have lower acceptance and may, in part, be a result of the requirement to disagree. Of these statements, d and e are within the 50% - 70% response range. The three statements that cause the most ambivalence are g, i, and j. Statement g - "There's a lot of electricity and oil around", favours agreement, however, media attention, world economics, local statistics, etc. have made this a difficult statement to reconcile. Statements i and j are linked because information availability would provide greater understanding on exactly what is involved in energy conservation in the home. The majority of respondents for i, however, (62%) do feel that saving energy can be done without too much trouble. Statement j is the most interesting in terms of awareness of government programs, in that, there appears to be no concensus on the availability of energy conservation information.

Table 3.4.5

Attitude Towards Energy Conservation

		Agree %	Neutral %	Disagree %
(a)	Everyone should be trying to reduce their energy consumption	98	2	-
(b)	A house that is well insulated is easier to sell	84	14	2
(c)	When I leave the house for any period of time I turn the thermostat down	89	6	5
(d)	The initial cost of insulation is too high in relation to the amount I will save later	18	26	56
(e)	The cost of fuel and electricity will not rise as rapidly over the next few years	10	26	64
(f)	An energy efficient home is worth a lot more if the time comes that you want to sell it	80	17	3
(g)	There's a lot of electricity and oil around	44	30	26
(h)	By insulating a house you make it more comfortable to live in	96	1	3
(i)	It is possible for me to save energy without much trouble	62	20	18
(j)	There is not enough information available on how to conserve energy in the home	39	31	30

3.4.6 INTEREST IN HOME ENERGY ADVISORY SERVICE

The survey posed a number of questions intended to indicate potential interest in a residential home energy advisory service. When asked if they would be interested in taking advantage of this type of service, 70% indicated that they would be interested.

Of those interested in the advisory service, 49% would be willing to pay for such a service whereas 51% were not interested in paying. By income level, 58% up to $26,000 and over group were willing to pay as compared to 48% ($14,000 - $25,999) and 43% (less than $14,000).

Of those willing to pay for the service, 113 (approximately 11% of the total survey sample) respondents were willing to pay $60. 61 respondents (approximately 6% of the total survey sample) were not willing to pay $60 for the service and 136 respondents (approximately 13% of the total survey sample were not sure whether they would pay $60 or not.

Table 3.4.6 indicates the breakdown of responses to the various questions on the energy advisory service.

In comparison to the survey (Appendix IX) carried out of the homeowners who received an energy survey, just over half of the sample would be willing to pay for an energy survey of their home. Of those who stated how much they would be willing to pay, 89.3% suggested $50 or less. The responses ranged from $10.00 to $200.00. In terms of the total number of homeowners receiving the energy survey and a copy of the questionnaire the willingness to pay for an audit represents about 22% of the total audits performed (compared with 32% of willing to pay in the mail panel survey).

TABLE 3.4.6

Willingness to Pay for Audit Services

Are You Interest in Service?

(n = 1015)

Yes %	No %
70.4	29.6

Would You be Willing to Pay?

	Yes %	No %
(32*)	48.7	51.3

Would You be Willing to Pay $60?

	Yes %		Not Sure %		No %
(11.3*)	35.9	(13.6*)	43	(6.6*)	20.9

If No, What Would You be Willing to Pay?

NIL	66.7%
< 10	2.1
10 - 20	19.4%
21 - 30	10.4
31 - 60	1.4

*Percent of total sample (n = 1015)

3.4.7 CONCLUSIONS

.1 The CHIP program may require alternatives or additions in order to reach its maximum potential take-up in Newfoundland and Labrador.

.2 The participation rate of CHIP is higher in the lower income grouping. This probably indicates the less attractive incentives available to families with incomes having higher marginal tax rate.

.3 The take-up rate for COSP is less than 10%.

.4 The potential for future take-up of the COSP - program may be in the region of 50-60% of the population.

.5 There appears to be some lack of certainty by homeowners as to whether CHIP and COSP grants are sufficient to reduce their home energy costs significantly.

.6 In excess of $1,000 is required to bring homes up to acceptable levels of energy efficiency in a majority of cases.

.7 Two to five years is considered to be an acceptable period for retrofit paybacks.

.8 For the most part, there is a high degree of energy conservation awareness in Newfoundland and Labrador.

.9 There is clearly a perceived need for information on energy conservation.

3.4.7 CONCLUSIONS (Cont'd)

.10 There is no significant difference in energy conservation attitudes and awareness between income levels.

.11 11% of the total sample indicated a willingness to pay $60 for a home energy survey. 13% were not sure.

.12 At best, 20% of homeowners would be interested in a $60 audit. A more realistic figure may be between 10-15% of the provincial housing stock, providing no significant changes with regards to incentives are made to the CHIP/COSP grants.

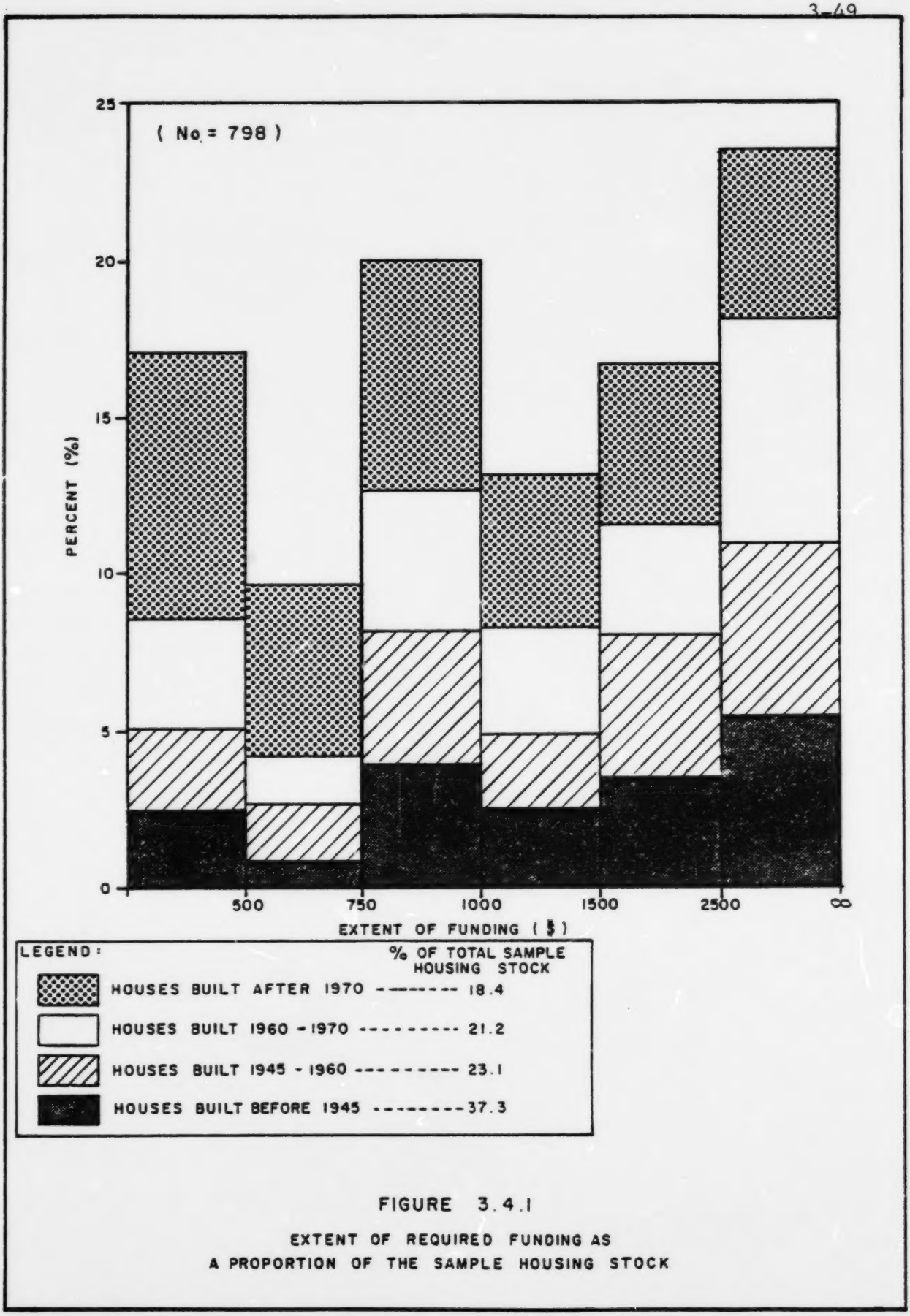
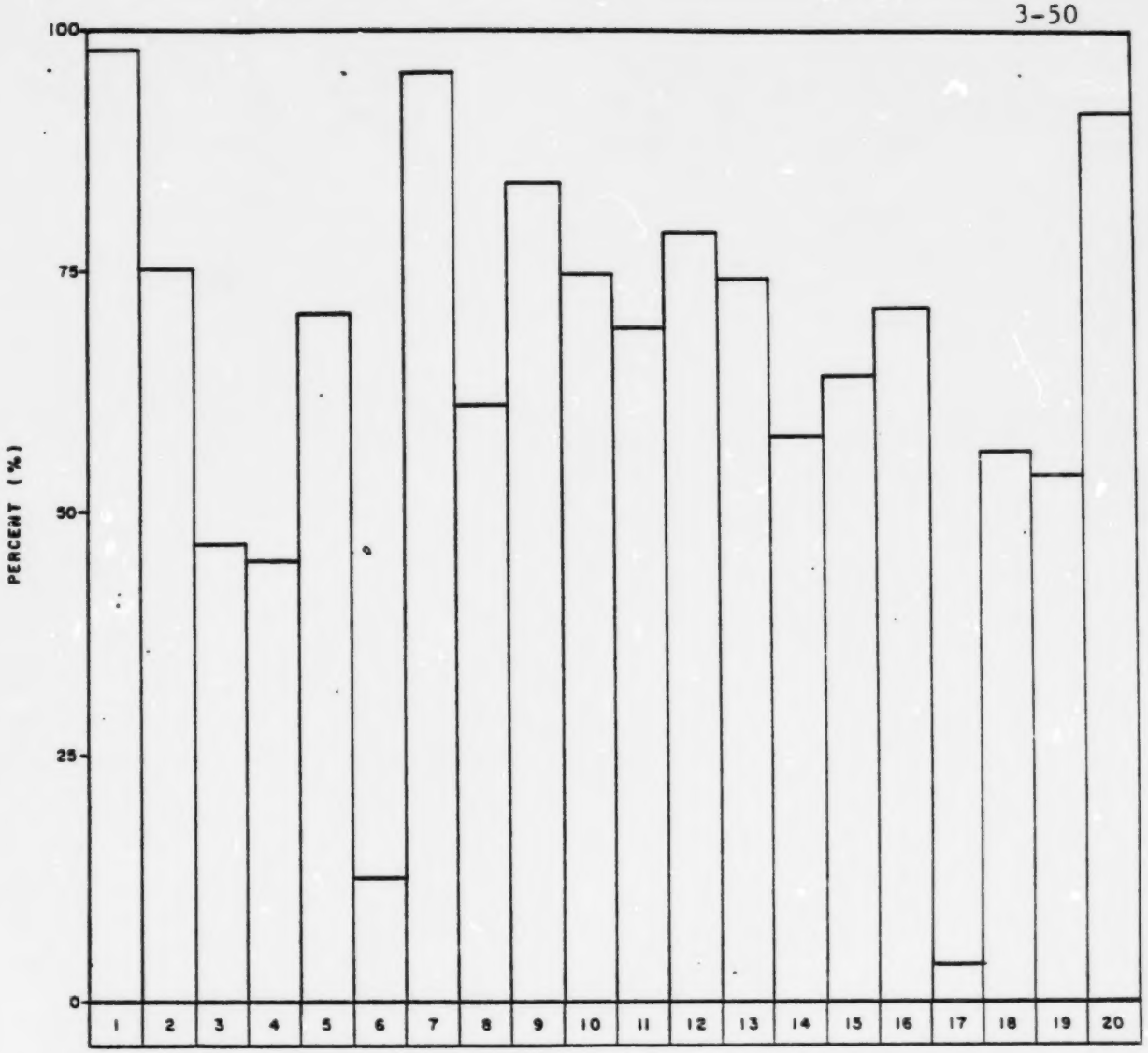


FIGURE 3.4.1

EXTENT OF REQUIRED FUNDING AS
A PROPORTION OF THE SAMPLE HOUSING STOCK



ENERGY CONSERVATION MEASURES:

1. Turn Off Lights & Appliances Not in Use
2. Avoid Freezer Ice Buildup
3. Ensure Freezer Full to Operate Efficiently
4. Close Off Portions of Home Not in Use
5. Use Cool Temps. in Wash Cycle
6. Install Hot Water Flow Restrictors
7. Set Back Thermostat at Nite
8. Have Furnace Tuned & Upgraded
9. Add Insulation to Attic
10. Add Insulation to Walls
11. Add Insulation to Basement
12. Add Weatherstrip to Doors
13. Add Weatherstrip to Windows
14. Add Weatherstrip to Attic Hatch
15. Add Caulking in Cracks
16. Install Storm Windows
17. Install Domestic Solar Hot Water System
18. Install Wood Stove
19. Reduce Temp. Setting on Hot Water Tank
20. Dry Clothes Outdoors

FIGURE 3.4.2

ADOPTION OF SPECIFIC ENERGY CONSERVATION PRACTICES

AS AN INDICATION OF ENERGY CONSERVATION AWARENESS

3.5 SELECTION CRITERIA FOR RESIDENCES

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3.5.1 INTRODUCTION

An important component of the Newfoundland Pilot Study was the development of criteria to select homes which could be considered typical of the provincial housing stock. The criteria was developed in two categories:

-- Category one consisted of the development of general criteria to allow targeting of areas containing typical housing within St. John's and its environs and Gander;

-- Category two consisted of the development of specific criteria to evaluate data from homeowners responding to an invitation for a free home survey.

The general criteria was based on the preliminary findings of the housing stock analysis, whereas the specific criteria was based not only on a general awareness of house parameters but also on the application form received from the interested homeowner following direct mail solicitation.

3.5.2 SELECTION CRITERIA

The housing stock analysis established the criteria which would indentify typical Newfoundland housing stock. The majority of the criteria, however, pertained to parameters which could only be assessed by individually inspecting potential homes. Due to time and cost constraints, this could not be accomplished

3.5.2 SELECTION CRITERIA (Cont'd)

during the pilot study. To overcome this problem, the criteria was developed in two categories. Category one criteria dealt with parameters which could be assessed by outside visual inspection, thus, windshield surveys could be conducted to establish areas of high concentration of typical housing. Based on the data obtained from the housing stock analysis, the following category one selection criteria were identified:

-- Type of Home: Single detached is typical however a small percentage of other homes were selected to fully test the audit procedure.

-- Type of Construction: The predominance is wood frame construction.

-- Shape: A cross-section of various house shapes were considered. The typical shape identified during the windshield survey was rectangular.

Having identified areas with high concentrations of typical housing potential, homeowners were contacted through the mail and invited to fill out an application form for a free energy survey. The application form (Figure 3.5.1) requested the information necessary to assess whether or not the home met the following category two criteria:

-- Age: An equal number of homes from the four construction periods were selected.

3.5.2 SELECTION CRITERIA (Cont'd)

-- Number of Rooms: The typical Newfoundland home has 5 - 7 rooms (70% of the housing stock)

-- Heating System: Electric radiant heating and forced air combustion furnaces are typical for the province.

-- Energy Source: Oil or other liquid gas accounts for over 50% of the primary energy source in the home. Over 33% of the province's homes use electricity for space heating.

3.5.3 CONCLUSIONS

Generally speaking the residence selection criteria was effective in locating and selecting typical homes for the pilot project. This is evident from the comparison of typical housing found in Newfoundland with the types of homes actually surveyed during the pilot. (Table 4.1). In conclusion it is felt that the use of selection criteria developed from a housing stock analysis in conjunction with windshield surveys is an effective way of selecting target sites which have housing representative of the provincial housing stock.

enerSave énerSage

Newfoundland & Labrador Home Energy Advisory Pilot Project

FIGURE 3.5.1

HOME ENERGY ADVISORY APPOINTMENT REQUEST FORM

NAME: _____

ADDRESS: _____

_____ POSTAL CODE: _____

PHONE: HOME _____ WORK _____

TYPE OF HOUSE:

Bungalow	____	Split Level	____
1 1/2 Storey	____	Split Entry	____
2 Storey	____	Trailer	____
3 Storey	____	Other (Please Specify)	____

IS YOUR HOME Attached ____ Unattached ____

(If attached, is it one side ____ or both sides ____)

YEAR HOUSE WAS BUILT ____.

HOW MANY FURNISHED ROOMS ARE IN YOUR HOME? (Do not include bathrooms, hallways, vestibules). ____

MAIN HEATING SOURCE FOR YOUR HOME (check only one).

Electric (baseboard)	____	Oil (Hot Water)	____
(other)	____	(Forced Air)	____
Oil Stove	____	Wood Stove	____
Other (Please specify)	____	Wood Furnace	____

HOW IS YOUR HOT WATER HEATED?

Electric Hot Water Tank	____	Coil in Boiler	____
Oil Fired	____	Propane	____
Coil in Wood Stove or Furnace	____	Other (Please Specify)	____

HAVE YOU APPLIED FOR A HOME INSULATION GRANT? ____ Yes ____ No

HAVE YOU APPLIED FOR THE CANADA OIL SUBSTITUTION PROGRAM?

____ Yes ____ No

3.6 ALTERNATIVE AUDIT COMPARISON

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3.6.1 INTRODUCTION

The Prince Edward Island Pilot Project developed software for residential energy audits that was based on the Millbank report, and on experience gained during field testing. In subsequent pilot projects such as the Newfoundland Pilot Study, attempts have been made to improve on the accuracy and efficiency of the analysis procedures. As such, one of the components carried out in the Newfoundland Pilot Study was a review and comparison of other residential energy audit procedures with the ENERPLAN procedure. The main objectives of the alternative audit comparison were as follows:

- Review information collection by other jurisdictions and note aspects worthy of consideration during the development of the Newfoundland Pilot project;

- Review means of dealing with moisture to avoid further instances of building deterioration which have occurred in some recently-built Newfoundland homes;

- Comment on ventilation requirements for homes converting from oil to electric heat;

- Investigate possible improvements to the ENERPLAN wood heating subroutine, as well as a means of modeling energy use in partially heated homes.

As time and money were limited in the development stage of the Newfoundland pilot study, the review

3.6.1 INTRODUCTION (Cont'd)

concentrated on suggesting changes that would probably make some improvements in the accuracy of the existing ENERPLAN procedure.

3.6.2 FINDINGS AND SUGGESTED CHANGES TO THE ENERPLAN PROCEDURE

The following section outlines the findings from the comparison of the ENERPLAN procedure with nine other residential energy audit programs, using the ENERPLAN data collection form as a basis. Appendix IV-A contains a comparison chart with a description of the nine other procedures.

.1 Review of Data Collection Approaches

a) Temperature differences between heated and unheated space within the building envelope. This information, although collected in the ENERPLAN data form, is not utilized because it is difficult to use in calculations. For partially heated houses it is important to base the effect of energy conserving measures on the total yearly heating bill (or amount of energy used).

b) Effect of attached unheated garage. The presence of an attached unheated garage is an extra insulation on the garage portion of the wall dividing the house and garage. That portion of the wall should be assigned an additional RSI 0.9 (R5) for purposes of heat loss calculations.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.1 Review of Data Collection Approaches (Cont'd)

c) Wind Exposure. The advisor should be provided with weather station data on wind for the areas in which he/she is operating. These should be compared to the wind velocity used in the ENERPLAN procedures to determine whether any changes (and their extent) are required relative to the figures used in that procedure. It is suggested that no further effect need be considered for infiltration or safety of operating combustion appliances.

d) Wood heating. The detailed use of wood heating was not found in the information collection used in other jurisdictions (obviously relating to a lack of significant use of this form of heating). This routine should be modified from the P.E.I. procedures to the extent that it appears necessary for confidence and reasonable accuracy. As a minimum, the estimate of the type of wood and its thermal output per litre (cord) should be collected for Newfoundland conditions.

e) Insulation potential. This item, although found on the ENERPLAN forms, was not used in P.E.I. Its only use in the Newfoundland Pilot Project would be to establish this information for record purposes. Since its primary application is for attics, we suggest that it be omitted;

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.1 Review of Data Collection Approaches (Cont'd)

f) Orientation. This aspect is not significant and could be eliminated;

g) Attic hatches and other perforations. Perforations in the building envelope should be flagged and noted in the final recommendations as an area for sealing/ weatherstripping;

h) Insulation shutters. The information collection should have some means of noting whether insulating shutters are being used and for the estimation of their effects;

i) Fireplaces. The information collection form should include the extent to which conventional fireplaces are used (hours/week) and whether they have energy efficiency features such as direct intake of outside air for combustion, glass doors, and a heat exchanger for ducted air. This information could be useful for record purposes;

j) Estimating energy saving in the 5th year. In addition to providing the homeowner with information on first year energy savings, it may be very effective to estimate the energy cost savings in current dollars during the fifth year, based on some form of annual price rise (e.g. 8%-10% per year) to underscore the significance of the ongoing and increasing savings possible.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.2 Infiltration Considerations

The following section discusses infiltration by both identifying the important parameters which affect infiltration estimates as well as suggesting changes which may improve infiltration estimation.

a) Estimating Infiltration Rates. Infiltration rates developed for the Prince Edward Island Pilot Project are based on a moisture rating established from the number of residents, perceived basement humidity, use of indoor/outdoor clothes drying, and extent of winter humidifier use. The moisture rating is combined with a variety of estimated humidity levels to produce the estimated air change on an hourly basis.

Comparisons of techniques for estimating moisture levels and air change from the following procedures was carried out:

- Alaska Division of Energy & Power Development,
- Pacific Power and Light,
- RISE (Rhode Islanders Saving Energy),
- CIRA (Computerized Instrumented Residential Audit);
- Retrotech.

Relevant excerpts from related data collection forms can be found in Appendix IV-B.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.2 Infiltration Considerations (Cont'd)

Recent studies to determine air change rates for housing in Canada were also reviewed. These studies have been largely based on pressure tests.

Based on the alternative audit review, it is felt that techniques for estimating infiltration could be improved by basing it on the following four (4) factors:

- Auditor observations regarding a need for sealing and weatherstripping in the building envelope;
- Use of the house related to occupants (number of entrances and exits);
- Whether there is a fireplace and the extent of its efficiency;
- Age of the house.

b) Auditor Observations Regarding the Integrity of the Building Envelope. The advisor should be able to make an estimate of the extent of which the envelope appears leaky. Sources of leaks are perforations in the walls and attic, placement of ductwork, and the use of undampered vents. Thses features provide the most direct link to infiltration and can be

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.2 Infiltration Consideration (Cont'd)

observed directly by the trained eye of the advisor. It is felt that having the advisor assess a home's infiltration should improve the existing method of relying on the home-owner to estimate moisture conditions as an indication of infiltration. Furthermore, presence of moisture has not proved to be a reliable indication of air tightness.

c) Number of Occupants. The number of occupants affects the air infiltration primarily through the number of times doors to the outside are opened and closed. The greater the number of entrances/exits, the greater the possible air change rate.

d) Fireplace and its Efficiency. The existence of a fireplace, its energy conservation features (or lack of same) and the extent of its use, also have direct implications for infiltration rates. A fireplace can require up to 165-190 L/s (litres per second) (350-400 cubic feet/minute) for combustion. This compares to about 40-50 L/s (85-100 CFM) for an oil-burning furnace. When the fireplace is in use, air for combustion escapes up the chimney and must be made up by infiltration. Infiltration tests have shown that housing built over the last 20-30 years in most of Canada have averaged an infiltration

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.2 Infiltration Consideration (Cont'd)

rate as low as about 0.3 air changes per hour. This is the equivalent of only 35-80 L/s (75-100 CFM) for a 93 sq. m (1,000 sq. ft.) bungalow. The air requirement for oil combustion furnaces is about 40-50 L/s (85-100 CFM). The impact of regular use of a fireplace on infiltration rates could therefore be significant.

e) Age of House. Canadian studies in recent years (Saskatchewan Research Council, National Research Council) have indicated that, over the course of a year, houses built during the late 1940's or later have a measured air change rate between 0.1 and 0.7 air changes per hour. Houses built earlier than this have a measured air change rate of about twice this amount.

f) Suggested Infiltration Estimate Procedure. This procedure takes the above aspects into consideration and is based on the RISE approach. It basically provides a range of 0.4-0.7 air change per hour for houses built after 1960 (a cut-off year later than the late 40's is suggested because of the apparent lag in evolution of house building techniques in Newfoundland as compared to the timing of their adoption in mainland Canada). The air change rate is increased by 50% for houses built before 1960, to account for the age factor. See Table 3.6.1 for details of the suggested subroutine.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.3 Improving Air Tightness and Implications for Combustion Appliances

Recent studies carried out by the Ministry of Housing of Ontario indicate that a likely average reduction in infiltration by taking a comprehensive approach to sealing and weatherstripping, and using reasonably good workmanship is in the order of about 20%. If the house is already at 0.4 air change per hour, we assume that no further reduction is possible given the average level of skills and materials available.

The 20% reduction factor has no serious implications for quality of air even if the house is relatively tight to start with. However, the one major expection to this is if the house is equipped with a combustion furnace, and also has a clothes dryer and/or exhaust fan, simultaneous operation of the furnace, the dryer and/or exhaust fan could reduce oxygen available for furnace combustion, and could cause a flue downdraft and permit build-up of carbon monoxide gas in the house.

The above condition could occur if the house is small and has an air change rate of 0.6 or less. Therefore, for safety reasons, the dryer and/or exhaust fan should not be able to operate in these houses when the combustion furnace is operating.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.3 Improving Air Tightness and Implications for Combustion Appliances (Cont'd)

This would suggest that the dryer, the exhaust fan and furnace should be wired so that the first two cannot operate if the furnace is on and vice versa. A less efficient alternative is a motorized damper which opens to permit outside air to enter when the furnace, dryer and/or exhaust fan operates simultaneously.

The alternative of venting the dryer indoors eliminates the problem of too great a draw on internal air. However indoor venting of the dryer could create serious humidity and condensation problems depending upon frequency of dryer use, and would allow lint build-up in air that could affect furnace combustion and air filter efficiency. There is also the added potential problem of a reduction in the quality of the air with respect to occupant health.

.4 Moisture Considerations

A number of cases have occurred in Newfoundland where recently-built homes have exhibited problems of severe deterioration due to water vapour condensation within layers of the building envelope. This problem has been primarily caused by internal moist air leaking through cracks and gaps in the building envelope and condensing as this air is

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.4 Moisture Considerations (Cont'd)

cooled below its dew point. The resulting moisture wets the sheathing, can form pools at the sill plate of walls, and can eventually cause rot of the sheathing. The problem is partly a function of building the exterior surface of the envelope tighter than the interior surface of the envelope. By so doing the internal air change rate and the rate at which the internal layers of the envelope can dry are reduced, thus permitting condensation build-up in the structure.

More recently, the use of electric baseboard heating has made the problem worse by further reducing the internal air change through elimination of exhaust of internal combustion air, which carried moisture. Because the retrofit program will include opportunities in Labrador to convert from oil to cheaper, more plentiful hydroelectric power, as well as recommendations for sealing and weatherstripping measures, there is concern about increased potential for moisture damage due to reduction in internal air change.

Moisture damage is caused by two types of condensation:

- condensation of warm moist air as it leaks into layers of the building envelope (interstitial condensation); and

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.4 Moisture Considerations (Cont'd)

- surface condensation on local cool spots on the interior surface of the building envelope (eg. windows)

Recent studies indicate that the most serious problem regarding moisture damage is brought about by interstitial condensation. This problem can be greatly reduced by carefully caulking and sealing the inner surface of the building envelope. Fortunately, surface condensation, the other type of condensation, can usually be seen by the homeowner and he can be advised to open a window slightly to help expel moisture-laden air or he can wipe the condensed moisture away.

A problem with air quality is not anticipated in regard to occupant health in electrically-heated homes, even after sealing and weatherstripping. The reason for this is that the air change rate following such sealing will likely be well in excess of 0.3, which is adequate for common household activities.

Therefore, the only caution required with respect to electrically heated homes (especially those that are converting from oil to electricity) is that the homeowner should:

- Seal all cracks and gaps in the inner surface of the building envelope;

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.4 Moisture Considerations (Cont'd)

- Check for local cool surfaces such as windows or closets with one or two walls coinciding with exterior walls, look for dampness or "fogging" and allow interior air to circulate over these surfaces; and

- Open a window slightly to encourage expulsion of some of the warm moist air that is producing this condensation.

In this manner, the problem of moisture can be greatly reduced. Further advice to the homeowner should include reducing internal generators of moisture such as avoiding clothes lines and storage of damp fuel wood in the home, adding a vapour barrier and concrete slab to basements with dirt floors, and permitting cross-ventilation by slightly open windows in moist basements.

.5 Wood Heating Subroutine

Wood heating is an attractive off-oil measure for many homeowners in Newfoundland. The wood heating subroutine for the Prince Edward Island Pilot Project originally encountered a number of problems relating to accurate modelling of energy consumption.

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.5 Wood Heating Subroutine (Cont'd)

Following a review of the ENERPLAN wood heating subroutine, discussions were held with officials from Consumers Gas, Toronto and the Canadian Combustion Research Laboratory, Ottawa. From the review and discussions, a number of factors which affect the accuracy of predicting costs and benefits of wood burning were identified. These factors were as follows:

- wood composition (ratio of hardwood to softwood per cord);
- moisture content (determined by percent of green wood used versus percent of air dried wood);
- local price aspects;
- effect of wind on dilution rates;
- furnace/stove replacement.

Clearly, an estimate must be made of local wood composition and moisture content to determine a basis efficiency for the fuel. The mix of wood and its moisture content may vary from location to location. The mix and moisture content should be related to assumptions made for these factors in the P.E.I. procedures to determine what adjustments should be made.

Local price aspects can be determined on the same

3.6.2 FINDINGS AND SUGGESTED CHANGES IN THE ENERPLAN PROCEDURE (Cont'd)

.5 Wood Heating Subroutine (Cont'd)

basis as for Prince Edward Island; ie. the market value per cord should be assigned to wood cut by homeowners on their own wood lots.

The effects of high winds on dilution rates (percent of heat loss up the chimney due to wind forces across the top of the chimney) may have to be considered in areas of high wind. The Prince Edward Island average wind appears in the range of 17 kph versus 23.1 kph (11.6 - 27.7 for 4 stations) for Newfoundland. Local Newfoundland weather stations information data regarding winds should be checked, and in high wind conditions (say, over 30 kph average), efficiency of the wood burning equipment could be reduced by, say, five percentage points.

Furnace and stove location also has an important impact. Although the Prince Edward Island study found insufficient evidence that the conventional wood-fired central heating system rated a higher level of efficiency than for stoves, allowance should be made for position of the stove. Locating it on an outside wall affects the seasonal efficiency, because of reliance on convection currents and radiation to reach the remainder of the home. A reduction of 15 percentage points could be assigned to wood stoves providing primary heat which are located against an outside wall.

BUILDING COMPONENT	GOOD	AVERAGE	POOR
WALLS AND ELECTRICAL OUTLETS	Ceiling and floor joints and corners well sealed electrical outlets with gaskets, no holes around plumbing penetrations o	Some cracks in ceiling and floor joints and corners, no gaskets on electrical outlets less than three plumbing penetrations with holes around them o	Many cracks in ceiling and floor joints and corners, no gaskets on electrical outlets, three or more plumbing penetrations with holes around them o
ATTIC FLOOR (CEILING)	No cracks in attic floor, no air shafts around flues, no holes around ducts, pipes or wiring penetrating attic floor, no recessed light fixtures, no trap door or weatherstripped trap door to attic o	Some cracks in attic floor, no air shafts around flues, some holes around ducts, pipes or wiring penetrating attic floor, less than three recessed light fixtures, un-weatherstripped trap door to attic o	Many cracks in attic floor, air shafts around flues, hole around ducts, pipes or wiring penetrating attic floor, more than three recessed light fixtures, uncovered attic access o
HEATING SYSTEM & WATER HEATER	Both furnace and water heater electric; if fossil fuel fired both in unconditioned space o	One fossil fuel-fired unit in living space with vent damper, the other in unconditioned space o	At least one fossil fuel-fired unit in living space without vent damper o
FIREPLACE OR WOOD STOVE	Sealed combustion wood stove or fireplace with well fitting damper and glass doors or no fireplace o	Poorly sealed wood stove or fireplace with either well-fitting damper or glass doors o	Both a wood stove and fireplace or a fireplace with poorly fitting damper and no glass doors o
DUCTWORK AND FLOOR	No ductwork and few floor penetrations or all ductwork in conditioned space and no floor penetrations o	Ductwork in conditioned basement and few floor penetrations o	Ductwork in unconditioned space and many floor penetrations o
VENTS IN CONDITIONED SPACE	No undampered vents and less than three dampered vents o	Less than three undampered vents or at least three dampered vents o	More than three undampered vents o
LIFESTYLE	Less than six entrances and exits per day o	Six to thirteen entrances and exits per day o	More than thirteen entrances and exits per day o
SUBTOTALS	___ x 1 = ___	___ x 2 = ___	___ x 3 = ___

TOTAL _____

TOTAL FROM ABOVE CHART	AVERAGE AIR CHANGE PER HOUR	
	1960 OR LATER	PRE 1960
7 - 10	0.4	0.6
11 - 16	0.5	0.75
17 - 21	0.7	1.15

TABLE 3.6.1

DETAILS OF SUGGESTED SUBROUTINE FOR ESTIMATING AIR INFILTRATION

3.7 PROCEDURE DEVELOPMENT

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3.7.1 INTRODUCTION

One of the main objectives of the Newfoundland Pilot Study was to review, modify, test and refine the ENERPLAN Procedure. The following are the sub-objectives dealt with in this section:

- Modify data and sub-routine content to include Newfoundland specific data and conditions;
- Ensure the modified procedure fitted Newfoundland housing types;
- Refine the format to ensure efficient and effective data collection.
- Present the homeowner with priorized, cost effective recommendations.

The description of the Procedure Development has been divided into four distinct sections:

(a) Prince Edward Island ENERPLAN Review - Where the ENERPLAN procedure was reviewed and compared with Newfoundland specific conditions;

(b) ENERSAVE Procedure Description and Refinements - Where all the retrofit options are described in detail and any changes in regional versions are documented;

(c) ENERSAVE Procedure Modifications - Where all the extra work authorized by Energy, Mines and Resources is documented. This work occurred after the main pilot was completed and as a result is not included in the Data Base Files; and

3.7.1 INTRODUCTION (Cont'd)

(d) Further Recommendations to ENERSAVE - Where improvements should be made to the procedure before the next generation of Pilot Studies are implemented.

3.7.2 PRINCE EDWARD ISLAND ENERPLAN REVIEW

.1 Retrofit Evaluation

With the assistance of an experienced local contractor, a listing of all possible residential energy retrofits was compiled for consideration and review. The listing outlined the existing conditions, the proposed retrofit, the materials required to carry out the retrofit and an estimate of the contractor installed cost. Appendix V-A contains the listing of retrofit options and costs initially considered in the project. In conjunction with the development of this listing, the existing ENERPLAN retrofits were analyzed for applicability to the Newfoundland housing stock.

.2 Geographic Evaluation

The original ENERPLAN procedure was set up for the entire Island of Prince Edward Island because of the small variation in climatic and economic parameters. Therefore only one version of the program was required to satisfy this limited range in climate and economic conditions. As a result of this and the compressed time frame under which the original procedure was developed, the variables relating to the housing types, climatic ranges and retrofit costs were interspersed throughout the program. For the Newfoundland Pilot Study the three separate

3.7.2 PRINCE EDWARD ISLAND ENERPLAN REVIEW (Cont'd)

.2 Geographic Evaluation (Cont'd)

regions of St. John's, Gander and Happy Valley - Goose Bay have three separate sets of these parameters which necessitate three versions of the procedure for Newfoundland and Labrador.

.3 Sub-Routine Evaluation

The original ENERPLAN procedure adopted specific sub-routines by Energy, Mines and Resources Canada from the Millbank Procedure. The ENERPLAN Pilot Study focused on oil fired heating systems and oil fired domestic hot water system improvements because the majority of all housing stock in Prince Edward Island was made up of these types of mechanical systems. As a result of this specific emphasis, attention to electrically heated houses was not given the same priority as the oil fired retrofit sub-routines. However, in Newfoundland, approximately one third of all houses are electrically heated which means that extra emphasis must be placed on the sub-routines pertaining to the calculation of the heating costs and the implementation of the related recommended retrofits.

.4 Data Input/Output Evaluation

The ENERPLAN data form was evaluated and found to be acceptable with respect to the data contained in it. It was therefore adopted as a guide for the development of the ENERSAVE Data Input form which is

3.7.2 PRINCE EDWARD ISLAND ENERPLAN REVIEW (Cont'd)

.4 Data Input/Output Evaluation (Cont'd)

described in more detail in Section 3.7.3.7. The ENERPLAN recommendation sheet was evaluated and found to be also acceptable as a guide for the future development of the ENERSAVE Home Energy Survey form which is described in Section 3.7.3.8.

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS

In order to assure a Newfoundland version of the ENERPLAN procedure would be available early for testing purposes, the first area addressed at the commencement of procedure development was the identification and incorporation of Newfoundland specific retrofit options. The total list of retrofit options, and associated costs, identified are presented in Appendix V-A and those which were actually incorporated are both flagged on the list and outlined in Sections .1 to .5 below.

As work progressed on the project the procedure was further refined and other retrofits and subroutines developed and added including:

- flat roof insulation retrofit
- standby domestic hot water substitution retrofit for the tankless coil, oil-fired hot water heater
- subroutine for conversion from oil-fired heating systems to electric heat (for Labrador only)
- improved wall insulation retrofit which combined the addition of wall insulation with the caulking of the floor to wall and ceiling to wall joints
- modification due to regional variations (see Section 3.7.3.6).

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

Appendix V-C contains all program up-dates and explanations for the above items.

The ENERSAVE Data Entry form, used by the advisor to record the data input of the energy survey, and the ENERSAVE Home Energy Survey form, the list of recommendations generated by the advisor as a result of the energy survey, were also refined during the project. These modifications are further addressed in Sections 3.7.3.7 and 3.7.3.8).

The retrofit options are broken down into five major categories as follows:

- insulation retrofits;
- sealing retrofits;
- domestic hot water systems retrofits;
- heating system retrofits;
- energy substitution retrofits.

The following subsections outline the retrofit options contained under each of the above categories.

.1 Insulation Grading

(a) Main Wall - The addition of blown-in insulation and caulking of the wall/floor joints and the wall/ceiling joint (where required);

(b) Added Wall - The addition of blown-in insulation and caulking of the wall/floor and the wall/ceiling joint (where required);

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.1 Insulation Grading

(c) Knee Wall - The addition of fibreglass batts to exposed knee wall and a polyethylene vapour barrier;

(d) Exposed Floor - The removal and replacement of the exposed floor from outside and the addition of fibreglass batts and vapour barrier to the exposed space;

(e) Main Attic - The addition of fibreglass batts to the ceiling area plus soffit vents;

(f) Added Attic - The addition of fibreglass batts to the ceiling area plus soffit vents;

(g) Sloped Attic - The addition of fibreglass batts, vapour barrier and drywall with studding from the inside of the house;

(h) Foundation - The addition of fibreglass batts, studding and vapour barrier to the concrete wall from the inside;

(i) Windows - The addition of a storm window to the existing window;

(j) Door - The replacement of the existing door with a thermal door.

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.1 Insulation Grading (Cont'd)

(k) Flat Roof - The addition of 150 mm of rigid insulation fastened to the existing tar and felt roof from the outside.

.2 Sealing Upgrading

(a) Windows - The addition of caulking and weather stripping;

(b) Doors - The addition of caulking and weather stripping; and

(c) Envelope - The addition of caulking to the basement/main wall joint, wall baseboards and ceiling and attic hatch areas.

.3 Domestic Hot Water System Upgrading

(a) Tank - The addition of fibreglass batts to the tank;

(b) Temperature - The reduction of the thermostat setting;

(c) Flow Restrictors - The addition of flow restrictors to the kitchen, bathroom and shower outlets.

(d) Standby Domestic Hot Water Substitution - The installation of an electric standalone hot water tank as replacement for a tankless coil during the non-heating season. The tank would be connected into the existing hot water piping system and valved to allow isolation from the boiler during the winter months.

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.4 Heating System Upgrading

(a) Service - The annual servicing of the furnace including the cleaning of the heat exchangers, replacement of the filters and general repairs to the furnace;

(b) Solenoid Valve - The addition of a solenoid valve to the fuel system;

(c) Retention Head - The addition of a retention head to the furnace which includes the rebuilding of the combustion chamber;

(d) Nozzle - The replacement of the existing nozzle with a downsized nozzle;

(e) New Unit - The replacement of the existing furnace with a new energy efficient furnace;

(f) Tuning - The tuning of the furnace to achieve maximum steady state efficiency;

(g) Lowered Fan Setting - The reduction of the fan setting on a hot air furnace to lengthen the on-time of the furnace.

.5 Energy Substitution Retrofits

(a) Conversion to Electric Heat - The installation of an electric furnace to replace the existing oil fired unit. (Applicable to Labrador only under existing COSP regulations);

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.5 Energy Substitution Retrofits (Cont'd)

(b) Conversion to Wood Heating - The installation of a wood/oil fired furnace to displace a portion of the heating load presently being meet by the oil fired unit.

.6 Regional Variations

Due to significant regional differences between certain areas of Newfoundland and Labrador it was determined that three separate versions of the procedure were required. These are identified as:

- E.C.A.P. Audit Kaypro Version #1 - St. John's, Newfoundland: Disk A
- E.C.A.P. Audit Kaypro Version #2 - Gander, Newfoundland: Disk A
- E.C.A.P. Audit Kaypro Version #3 - Labrador, Canada: Disk A

These versions are set up to take advantage of the Kaypro microcomputer's increased disk storage, therefore, the entire audit procedure is on Disk A. This leaves Disk B available expressly for the housing and audit data and a single disk has the capacity to store this information for up to 40 houses. Each version has its own unique data files on: retrofit types, cost information, and climatic data for use at its designated location.

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.6 Regional Variations (Cont'd)

The three separate listings of the code documentation mentioned previously have been included in ShawMont Report SMR-7-83. For easy reference one version is also included in Appendix V-E.

.7 ENERSAVE Data Input Form

The ENERSAVE Data Input Form (Appendix V-B) incorporates the bulk of the original ENERPLAN form. There were, however, some changes and additions to the ENERPLAN form to accommodate regional specific parameters as well as to make the form easier to fill out and understand.

The improvements incorporated for the new ENERSAVE form consisted of:

- moving the notes particular to the individual sections from the back page to the side of the appropriate page;
- adding the input section necessary for the flat roof retrofit;
- adding an input block for the domestic hot water heater efficiency.
- toning down the graphics on page two so that the advisors sketches are easier to produce and read.
- miscellaneous minor changes

An individual page describing each new input block and changes was prepared and an advisor input manual was produced to assist the advisors in becoming familiar with the data required in each input block. This manual is essentially the same document as was used in the Prince Edward Island pilot study with changes made as required to accommodate the

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.7 ENERSAVE Data Input Form (Cont'd)

modifications to the ENERPLAN Input Form. The pages of this document which were changed and any new pages added are presented in Appendix V-D.

.8 ENERSAVE Home Energy Survey Results Form

The ENERPLAN data output format has been extensively modified to suit the Newfoundland specific conditions. The new ENERSAVE recommendations form was expanded into a two page foldout to allow for:

- more space to write the recommendations;
- an extra category to suggest applicable government programs;
- a section on homeowner maintenance advice; and
- a section on the technical reference information which highlights for the homeowner the appropriate nozzle sizes and current burner efficiency.

The order of the recommendation blocks or insulation, sealing, heating system and hot water system recommendation has been rearranged to conform with the order in which the computer presents the recommendations.

.9 Procedure Verification

In order to ensure that accurate information was being delivered to the homeowner by the advisor a procedure verification program was initiated at the

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.9 Procedure Verification (Cont'd)

beginning of the project. The program consisted of three distinct phases:

- Phase 1 - Initial Program Verification.
- Phase 2 - Training Course Program Verification.
- Phase 3 - Pilot Study Program Verification.

The Initial Program Verification was used to ensure that the regional weather and cost data were entered correctly and the recommendations which were produced were accurate. This verification took place between September 22 and October 7, 1982. A total of eight houses in St. John's were surveyed during this phase. At this point the flat roof recommendation was added and the ENERSAVE Data Input Form was changed to accomodate this category.

The Training Course Program Verification covered the period between October 8, 1982 and November 18, 1982. In this phase the eight advisors conducted a total of thirty-six house surveys which included three empty house surveys. During the training, course advisor de-briefing sessions took place which analyzed discrepancies in test results from the surveys. At this point comments were made, analyzed and, where relevent, included in the procedure. Of particular note was the difference between the projected space heating cost and the calculated space heating cost. This was later refined.

3.7.3 ENERSAVE PROCEDURE DESCRIPTION AND REFINEMENTS (Cont'd)

.9 Procedure Verification (Cont'd)

The Pilot Study Program Verification covered the main pilot period between November 19, 1982 and December 10, 1982. In this phase, 101 homes were surveyed (72 in St. John's, 20 in Gander and 9 in Happy Valley - Goose Bay). A debriefing session took place every Friday during the pilot study. Problems related to the computer program were discussed and either resolved or noted for correction in future pilot studies.

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS

.1 Background

During the initial procedure review, and throughout the field testing of the audit procedure, small refinements took place. The majority of these refinements have been previously described in Section 3.7.3, however, there was still considerable difference between the Projected Cost (1982-83) which is defined as space heating cost based on the homeowner supplied information and escalation factor for the heating season of 1982-1983 and the Calculated Cost which is defined as the space heating cost based on the data collected by the home energy advisor in the field. There were two main reasons suggested to account for this discrepancy.

- that the free heat subroutine underestimates the contributions from people, applicances, lighting, domestic hot water and solar gain; and

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.1 Background (Cont'd)

- that the infiltration subroutine may over- or under-estimate the heating load from air changes because of its use of moisture as an indication of air change in the home.

As a result of these concerns, extra work was authorized to investigate the development of a new free heat subroutine to better define the contributions listed previously, and to make use of the existing unused data input blocks on the ENERSAVE Data Input form. The infiltration subroutine was not investigated at this time because of time constraints, however the Yukon Pilot Project has developed a new infiltration subroutine based on the crack length method which uses the leakiness of the windows and doors to establish the air change rate in the house.

Concern was also shown by the Newfoundland advisors with respect to the thermostat setback routine. The savings indicated by the existing recommendation seemed to be quite high and further refinement seemed desirable.

.2 Free Heat Subroutine

The existing free heat subroutine uses the Millbank procedure which reduces the calculated total heating factor by 50 Watts/^{o}C to 110 Watts/^{o}C - depending on the house's solar exposure and number of people. The new procedure is a modification of the HOTCAN procedure which was originally developed by the National Research Council's Division of Building Research in Saskatoon, Saskatchewan. It calculates the internal heat gain as:

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.2 Free Heat Subroutine (Cont'd)

- a function of the amount of equivalent electricity in KWH/day for appliance use, domestic hot water usage and the number of people in the house, and as,

- a function of the solar radiation impinging on the glazing in all four cardinal directions (North, South, East and West).

This procedure modifies the solar gain further by allowing for simple shading reduction due to window overhangs.

The new sub-routine follows several simplifying assumptions in order to eliminate the need for new questions on the data form. These assumptions are as follows:

(a) The program projects appliance free heat on the summer electric bills. The electrical data is recorded in Questions No. 108 to 117. If this information is missing, default values have been built into the program to calculate this free heat component as a function of the number of people;

(b) The program calculates actual domestic hot water usage based on the homeowner's response and projects the free heat contribution of this usage;

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.2 Free Heat Subroutine (Cont'd)

(c) The program uses a shading coefficient based on a typical housing geometry from the HOTCAN data base;

(d) The window data (Questions 201 to 256) are used to determine the aperture openings in all four cardinal directions (North, South, East and West) in order to calculate the solar gain from these directions.

The logic of the improved free heat sub-routine has been presented in the form of a computer flow chart (Figure 3.7.1) outlining the decision tree, the individual code modules and the beginning and the ending line numbers of the total sub-routine. The listing of the computer code is found in SCRUNCH.BAS, lines 1440 to 2420, located in Appendix V-E.

.3 Free Heat Subroutine Verification and Conclusions

In order to determine the effect of the new subroutine a two stage verification process took place. The first stage of the verification consisted of a detailed comparison of two houses for which both the ENERSAVE program and the HOTCAN program were tested. The second stage of the verification involved running a random sample of 14 houses with the new subroutine and comparing it to the old subroutine to determine its effect on the calculated heating cost. It has been found that the average ratio of new to old free heat values is 0.977. After reviewing the results of the new free heat subroutine the following observations have been made:

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.3 Free Heat Subroutine Verification and Conclusions (Cont'd)

- The new free heat subroutine does not appreciably affect the results of the calculated heating costs as it was previously thought. Therefore for the present housing stock the old subroutine is adequate;
- For passive solar houses the new subroutine will give more accurate results because it considers solar gain;
- The errors in the calculated free heat subroutine are from errors in shell insulation estimates and errors in gross area calculations.

.4 Automatic Thermostat Subroutine

The existing procedure sets back the thermostat to $20^{o}C$ and $17^{o}C$ for day/evening usage and night usage respectively if an automatic setback thermostat has been indicated on the data input sheet. The problem with the recommendation is that if the temperatures given by the homeowner are less than $20^{o}C$ and $17^{o}C$ the computer program resets the lower temperatures to $20^{o}C$ and $17^{o}C$ and then calculates the savings based on these higher temperatures. This overestimates the setback savings based on the homeowner supplied temperature regimes.

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.4 Automatic Thermostat Subroutine (Cont'd)

The improved procedure begins by redefining the rationale behind temperature setback. This procedure assumes that there will be savings available at all times if the temperatures are above certain preset values. If the temperatures of the house are below these values then the savings are reduced to nothing. With this procedure the savings are more realistic because there is no defaulting to higher house temperatures.

The new subroutine has been developed to use the existing question slot 282 as the data input. There are two variations possible with this subroutine as a function of the new question 282: Is the house occupied during the daytime (From 8 AM to 4 PM)? No = 0, Yes = 1.

If NO is the response, the daytime temperature is compared to 17°C and if over 17°C, the computer calculates the savings. This takes advantage of the temperature setback during daylight hours. If YES is the response the daytime temperature is compared to 20°C and if the temperature is above 20°C the savings are calculated. This recommendation now calculates savings for all cases when the temperatures are above the present values. In addition, it uses the three temperature settings, day, evening and night instead of the two temperature settings-day and night-as in the old recommendation. If there is no saving the recommendation will not be displayed in the data output.

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.4 Automatic Thermostat Subroutine (Cont'd)

The logic of the new automatic thermostat subroutine has been presented in the form of a computer flow chart as well (Figure 3.7.2). This flow chart outlines the decision tree, individual code modules and the beginning and the ending line numbers of the total subroutine.

A listing of the improved subroutine is found in SCRUNCH.BAS from lines 4160 to 4340 in Appendix V-E.

.5 Automatic Thermostat Subroutine Verification and Conclusion

The new subroutine was checked manually to compare it to the old routine for the same input values and the new routine produced the same figures for temperatures above the recommended values of 20°C and 17C. The subroutine was then checked for the recalculated values in five file cases. The results of the new subroutine were that the new savings were roughly 47% of the old savings value, thus affecting the payback by lengthening it from an average of 0.7 years ($\pm$ 0.23 years) to a payback of 1.82 years ($\pm$ 0.98 years). These values are more realistic if simple temperature setback is followed by using an automatic thermostat.

3.7.4 ENERSAVE PROCEDURE MODIFICATIONS (Cont'd)

.5 Automatic Thermostat Subroutine Verification and Conclusions

The new thermostat subroutine has the following three improvements. It gives a more realistic determination of the potential savings which can be realized through setback. It does not reset the homeowner supplied thermostat readings to the recommended 20°C and 17°C if the temperature is below these settings. It includes the provision for savings if the house is not occupied from 8 AM to 4 PM.

3.7.5 CONCLUSIONS AND RECOMMENDATIONS

This section outlines further work which should be undertaken to improve the calculation procedure before the next stage of the program is implemented.

.1 Infiltration Subroutine

Due to the time constraints imposed by the original contract the infiltration subroutine used in the Prince Edward Island software was kept intact for the Newfoundland program. However, following the review of the subroutine, some concern was expressed regarding the use of moisture as a tracer gas to determine the infiltration rate for the home. It is felt that because of the high relative humidities found in coastal regions of the province especially during the late fall and late spring (part load conditions) the moisture tracer gas method may underestimate the air change in the house and

3.7.5 FURTHER RECOMMENDATIONS TO THE ENERSAVE PROCEDURE (Cont'd)

.1 Infiltration Subroutine (Cont'd)

therefore produce erroneous results. Other methods for calculating or estimating infiltration (such as the new Yukon subroutine) should be thoroughly examined and the existing infiltration subroutine modified accordingly if more accurate techniques are available and proven. The exposure factor should also be adjusted for areas of consistently high winds such as St. John's.

.2 Cost Totalling Subroutine

The present procedure is set up to present recommended savings as if each recommendation would be the only one implemented. This can lead to the situation where the total savings presented to the homeowner can exceed the energy bill of the house.

A new subroutine should be developed to accumulate the savings within each of the four main recommendation categories in the Home Energy Survey recommendation sheet and correlate the four category savings totals so they present realistic cost savings. Net energy gains would be allowed in the case of a passive or active solar heat house. A suggested procedure would be the one found in N.R.C. Building Note 20, May 1981.

.3 Data Input Subroutine

The existing procedure has been setup so that regional variables such as contractor costs and weather data are contained within the computer code

3.7.5 FURTHER RECOMMENDATIONS TO THE ENERSAVE PROCEDURE (Cont'd)

.3 Date Input Subroutine (Cont'd)

on a line by line basis. This becomes very time consuming when new regional versions must be developed. A superior subroutine would access individual data files corresponding to each region as required by specifying a city/region from an input menu when the data is entered. The KayPro II is especially suited to these applications because of its large storage capacity on Disk A. There is sufficient room on the disk to allow for several city/-regions data files to be stored. This feature would be particularly useful in the cases where the weather data is similar - for example, Goose Bay versus coastal Labrador - but the energy rate structures and retrofit implementation costs are quite different.

.4 Recommendations Resulting From the Alternative Audit Review

A study of audit procedures being used in other jurisdictions was carried out and the report on the results of this study presented various recommendations for modifications to the ENERPLAN Procedure. The recommendations from this review which were considered for the Newfoundland procedure are:

(a) Wood Heating Subroutine - The wood types and corresponding thermal values were corrected for Newfoundland conditions;

3.7.5 FURTHER RECOMMENDATIONS TO THE ENERSAVE PROCEDURE (Cont'd)

.4 Recommendations Resulting From the Alternative Audit Review (Cont'd)

(b) The Insulation Potential - This was kept for the Newfoundland subroutine rather than being omitted as suggested by the audit review to be consistent with the other pilot program's data base;

(c) House Orientation - This was kept rather than being omitted for use in the new free heat subroutine, and

(d) Attic Hatches and Other Perforations - These were brought to the advisor's attention for note on the maintenance section of the recommendation form, when required.

Other recommendations which were suggested from the alternative audit review, besides the infiltration subroutine which has been previously addressed, which have not been included in the Newfoundland procedure because of time constraints or other noted reasons but which could be considered for possible future inclusion are:

(a) Effect of attached unheated garages: The presence of an attached unheated garage is an extra insulation on the garage portion of the wall dividing the house and garage. That portion of the wall should be assigned an additional RSI 0.9 (R5) for purposes of heat loss calculations.

3.7.5 FURTHER RECOMMENDATIONS TO THE ENERSAVE PROCEDURE (Cont'd)

4. Recommendations Resulting From the Alternative Audit Review (Cont'd)

(b) Insulating shutters: The information collection should have some means of noting whether insulating shutters are being used and estimating their effects;

(c) Fireplace: The information collection form should include the extent to which conventional fireplaces are used (hours/week) and whether they have energy efficiency features such as direct intake of outside air for combustion, glass doors, and a heat exchanger for ducted air. This information could be useful for record purposes;

(d) Estimating energy saving in the 5th Year: In addition to providing the homeowner with information on first year energy savings, it may be very effective to estimate the energy cost savings in current dollars during the fifth year, based on some form of annual price rise (eg. 8% - 10% per year) to underscore the significance of the ongoing and increasing savings possible.

3.7.5 FURTHER RECOMMENDATIONS TO THE ENERSAVE PROCEDURE (Cont'd)

.4 Recommendations Resulting From the Alternative Audit Review (Cont'd)

(e) Wind/Dilution Interaction: The effects of high winds on dilution rates (percent of heat loss up the chimney due to wind forces across the top of the chimney) may have to be considered in areas of high wind. The Newfoundland average wind is in the range of 22.7 kph (11.6 - 27.7 kph for 4 stations). Local weather stations information data regarding winds should be checked and in high wind conditions (say, over 30 kph average), efficiency of the wood burning equipment could be reduced by, say, five percentage points. Further work on this is being conducted at the Canadian Combustion Research Laboratory.

(f) Furnace, Stove Location: Furnace and stove location have an important impact. Although the P.E.I. study found sufficient evidence that the conventional wood-fired central heating system rated a higher level of efficiency than for stoves, allowance should be made for position of the stove. Locating it on an outside wall affects the seasonal efficiency because of reliance on convection currents and radiation to reach the remainder of the home. A reduction of 15 percentage points could be assigned to wood stoves providing primary heat which are located against an outside wall, but further work is required to specifically include this item.

FLOWCHART FOR

NEW FREEHEAT SUBROUTINE

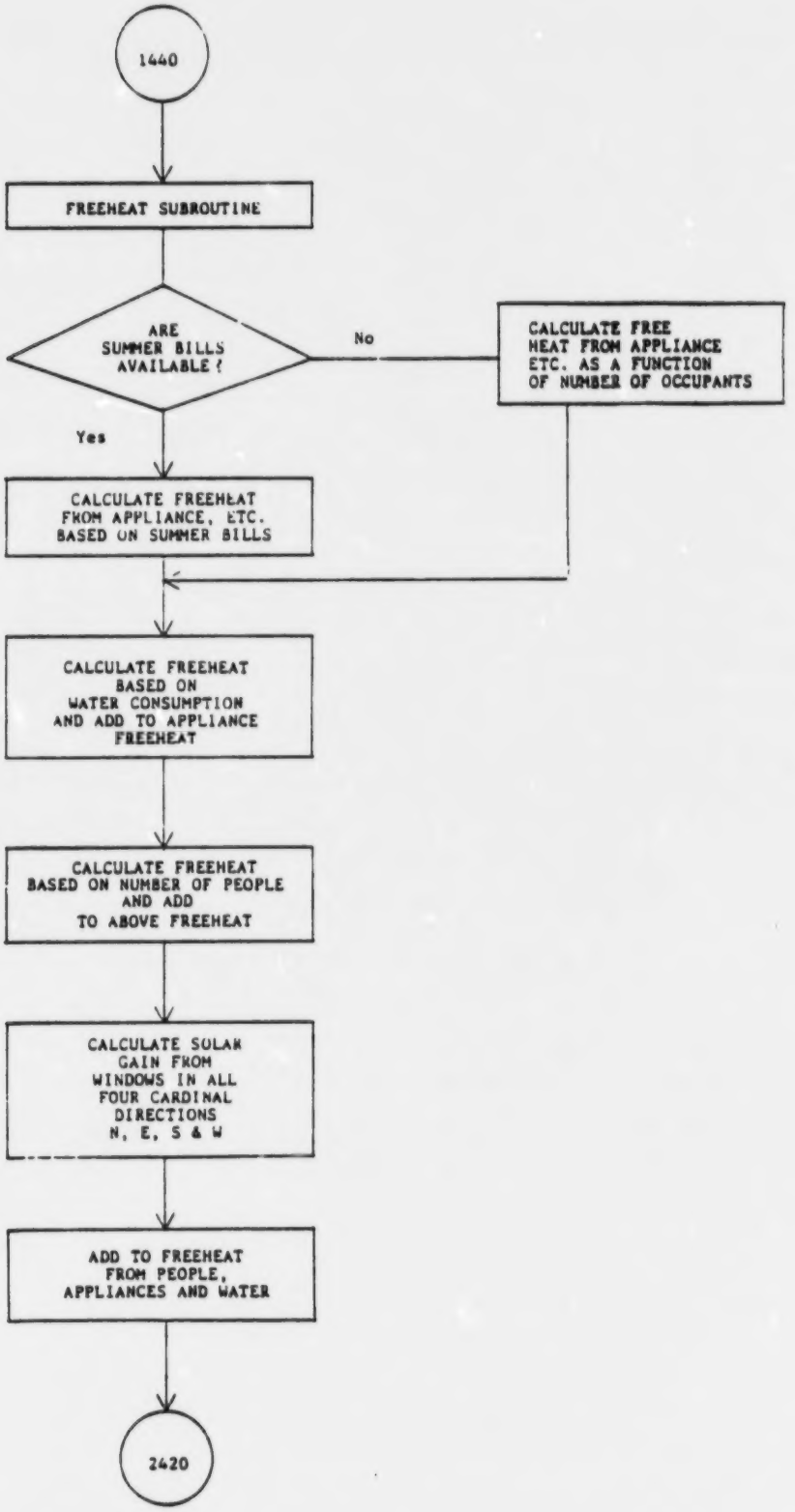
1440
FREEHEAT SUBROUTINE
ARE SUMMER BILLS AVAILABLE ?
No
CALCULATE FREE HEAT FROM APPLIANCE ETC. AS A FUNCTION OF NUMBER OF OCCUPANTS
Yes
CALCULATE FREEHEAT FROM APPLIANCE, ETC. BASED ON SUMMER BILLS
CALCULATE FREEHEAT BASED ON WATER CONSUMPTION AND ADD TO APPLIANCE FREEHEAT
CALCULATE FREEHEAT BASED ON NUMBER OF PEOPLE AND ADD TO ABOVE FREEHEAT
CALCULATE SOLAR GAIN FROM WINDOWS IN ALL FOUR CARDINAL DIRECTIONS N, E, S & W
ADD TO FREEHEAT FROM PEOPLE, APPLIANCES AND WATER
2420

Figure 3.7.1

FLOWCHART FOR

NEW THERMOSTAT SUBROUTINE

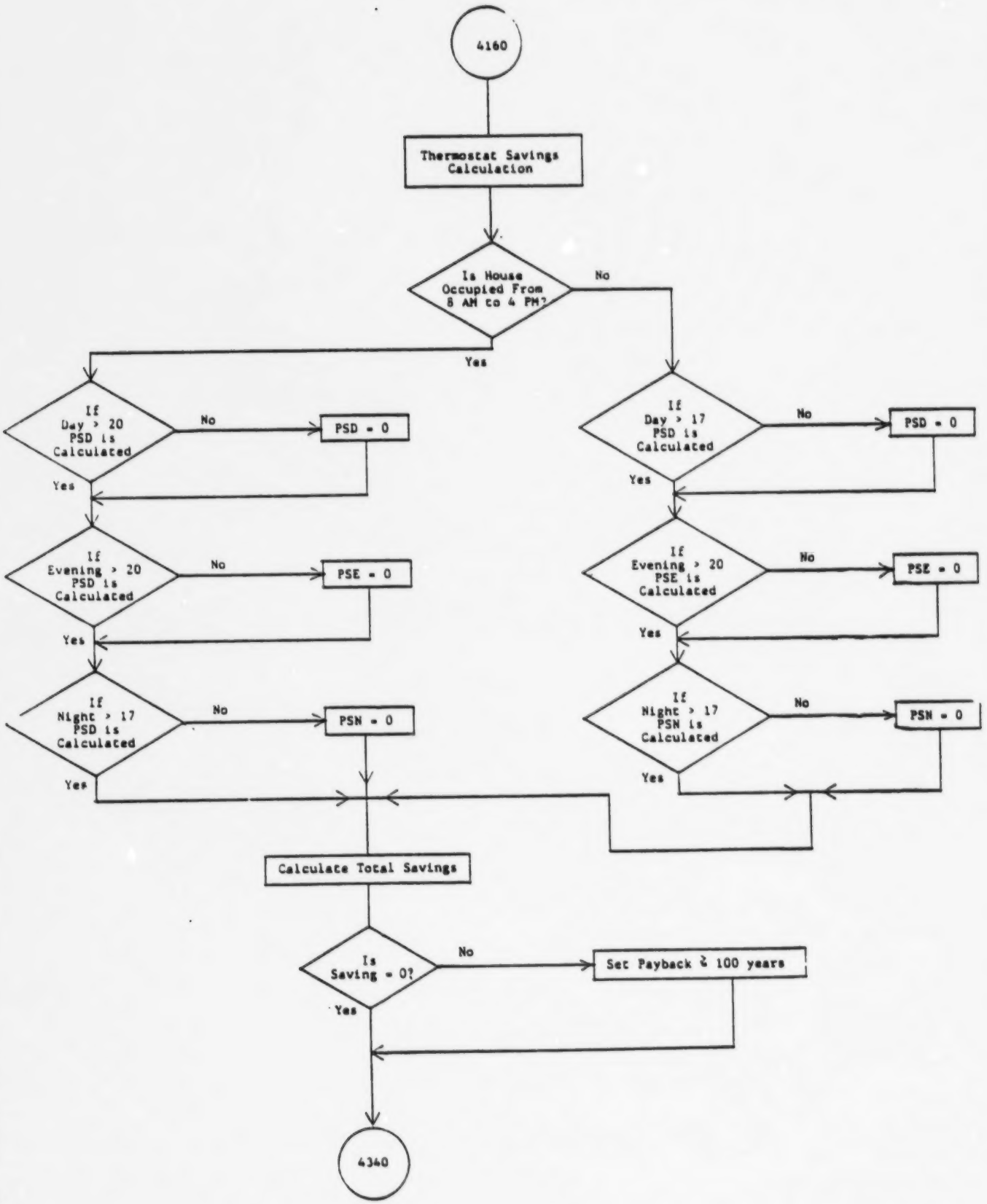

Figure 3.7.2

3.8 SELECTION OF ENERGY ADVISORS

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3.8.1 INTRODUCTION

One of the most important components carried out in the Newfoundland pilot study was the selection of individuals for training as residential energy advisors. Through experience gained in the two week orientation session in Prince Edward Island, it became evident to the project team that the success or failure of the Newfoundland pilot study would largely depend on the calibre and performance of the individuals selected to become energy advisors.

The first step in the selection of potential residential energy advisors for the pilot project was to develop a criteria which identified the basic skill requirements necessary to become an advisor. To attract potential candidates, an advertisement was placed in the local papers which briefly described the project and outlined necessary qualifications for the position offered. Interested candidates were requested to pick up application forms at the College of Trades and Technology in St. John's and the Hotel Gander in Gander. Potential candidates, selected from the application forms, were contacted and requested to attend a general meeting in their respective areas. During the general meeting, the advisor job description was explained as well as the overall objectives of the program. Following a question and answer period, the applicants were asked to fill out a short test and were then interviewed. Potential candidates were contacted and requested to attend a second interview following which eight applicants were selected to attend the

3.8.1 INTRODUCTION (Cont'd)

training program. Following the conclusion of the training program, four trainees were selected for the main pilot.

3.8.2 ADVISOR SELECTION CRITERIA

Based on the experiences noted during the Prince Edward Island pilot program, the following advisor selection criteria was used to select potential candidates from applications received in response to the newspaper advertisement:

- Obvious communication and interpersonal skills;
- Proven interest in and concern for energy conservation;
- Understanding of house construction and other technical aspects;
- Education level.

A more detailed set of criteria was used to further select candidates from the general meeting to attend the second interview. This criteria was applied during five minute interviews held at the conclusion of the meeting which provided an opportunity to evaluate the communication skills of the individual. The following is a listing of the criteria used during the general meeting and second interview to select the eight residential energy advisors for the training program.

3.8.2 ADVISOR SELECTION CRITERIA (Cont'd)

.1 Primary Requirements (Cont'd)

(a) Good communication skills

- Relates well to strangers in a one on one situation
- Engenders trust
- Confident, but not overly confident

(b) Self-motivated

(c) Neat appearance

(d) Can think on his/her feet - reacts well to unexpected situations

(e) Physical requirements:

- Able to negotiate crawl spaces, attic hatches, basements
- Fit enough to work full-time

(f) Positive attitude toward energy conservation

- Has personally participated in some aspects of conservation

(g) Willing to learn

- Has some background in adult training or education

(h) Can handle fundamental math problems and use a calculator

(i) Has a valid driver's license

.2 Secondary Skills or Experience

(a) Knowledge of building dynamics

(b) Can estimate measurements

(c) Has been self-employed

(d) Has been a teacher or group leader

(e) Some familiarity with the use of test instruments, measuring tape or computers

3.8.3 ADVISOR SELECTION PROCESS - TRAINING COURSE PARTICIPANTS

.1 St. John's

Following the placement of the advertisement (Appendix VI-A), the advisor application forms were made available at the College of Trades and Technology. Application forms (Appendix VI-B) were designed in an 8 1/2" x 14" legal sized paper format to allow all information to be collected on one page. These forms were made available through the College of Trades and Technology in St. John's and 85 applications were received.

A preliminary selection to extract obvious non-candidates was carried out and 58 people were contacted to attend a briefing/pre-selection meeting. Of the 58 candidates contacted by phone, 51 attended. The meeting commenced with an introduction of the project and explanation of its background and objectives via EMR's ECAP slide presentation.

Following a question and answer period, the applicants were asked to fill out a pre-test (Appendix VI-C)and were then interviewed by three members of the project team. Each of the interviewers asked the candidates the same question which was related to a question on the pre-test sheet. The interviewers completed an assessment sheet (Appendix VI-D) per candidate immediately after each interview. Based on the previously established criteria, 16 applicants were selected and contacted to attend a second interview.

3.8.3 ADVISOR SELECTION PROCESS - TRAINING COURSE PARTICIPANTS (Cont'd)

.1 St. John's (Cont'd)

Three days later, the same three members of the project team interviewed the applicants contacted for the second interview. Following the interviews, the list of possible applicants was reduced to nine using the secondary Interview Forms contained in Appendix VI-E. The list consisted of six preferable applicants and three alternates. The alternates were to be contacted should any of the six candidates turn down the position offered to them. During the week of September 27 to October 1, 1982, the six candidates were contacted and offered the opportunity to train for the position of energy advisor, all of whom accepted.

The six individuals chosen from St. John's were:

(a) Woman, Age 21, Property Appraiser, recently graduated

(b) Man, Age 23, Experience in Surveying and Architectural Drafting.

(c) Woman, Age 28, Homemaker, Commercial Artist.

(d) Man, Age 24, Research Assistant - Solar greenhouse design, Engineering diploma from Nova Scotia Agricultural College.

(e) Woman, Age 30, Homemaker, Receptionist.

(f) Man, Age 25, Retail Sales Manager/Clerk.

3.8.3 ADVISOR SELECTION PROCESS - TRAINING COURSE PARTICIPANTS (Cont'd)

.2 Gander

A similar criteria was used to select candidates from the Gander area. The application forms received were reviewed and 8 candidates were contacted for an interview. Following the interview, 2 candidates were offered the opportunity to train for the position of energy advisor, both of whom accepted. The two individuals chosen from the Gander area were:

(a) Man, Age 18, Computer Science Student

(b) Man, Age 24, Marine Engineer

Appendix VI-F contains an information sheet on each of the applicants selected for the training program.

3.8.4 ADVISOR SELECTION PROCESS - MAIN PILOT

The students were evaluated on the basis of their performance in the classroom and during their field surveys. The classroom evaluation was performed by the Chief Instructor and the Course Co-ordinator. Both of these individuals selected the four trainees whom they felt had best developed the technically related skills necessary for a successful residential energy advisor. These recommendations were recorded by the Project Manager but were not divulged to the assessment team responsible for evaluating the survey techniques of the students.

3.8.4 ADVISOR SELECTION PROCESS - MAIN PILOT (Cont'd)

The field advisors assessment team comprised four other members of ShawMont's Project Team. Each assessor acted independently to reduce tension on the trainee and to ease homeowner interaction. Each trainee was required to lead two field surveys and was evaluated on the basis of a predetermined criteria (Appendix VI-G) This system was considered the most objective as, over the lifetime of project and including the evaluation surveys, each member of the assessement team had the opportunity to observe every one of the trainees in the field. The trainees carried out their two surveys on the same day and the assessment team evaluated a different trainee in each of the morning and afternoon surveys.

Following the two days of evaluation audits, the four members of the assessment group discussed their findings and came to the conclusion that all eight trainees were capable of conducting efficient and effective residential audits and should be recommended for graduation from the training course. Each assessor prepared an independent evaluation, with respect to the pre-established criteria, of each trainee and from these evaluations, together with the classroom evaluation, the four trainees for participation in the Main Pilot were selected.

The four successful advisors were:

Tracey Cook	-	St. John's
Fred Doyle	-	Gander
Bryan Dunne	-	St. John's
Richard Mackey	-	St. John's

3.8.5 CONCLUSIONS AND RECOMMENDATIONS

.1 The establishment of a review board to carry out a series of interviews is essential in the selection process for trainee advisors.

.2 Superior levels of higher education should not be considered of major significance in the selection requirements.

.3 In combination with communication skills, previous academic skills related to technical matters are a a useful guide in identifying potential energy advisors.

.4 Notwithstanding 4 above, good communication skills alone are sufficient providing enough time is available for technical considerations during the training course.

3.9 TRAINING COURSE

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3.9.1 INTRODUCTION

The energy advisor training program was jointly developed by the Extension Services Department of the College of Trades and Technology and ShawMont Newfoundland Ltd. The College of Trades and Technology is the largest and best equipped vocational training centre in Newfoundland. The course was delivered at the main campus of the College located on Prince Philip Drive in St. John's. Access was made available to all necessary resource material and demonstration laboratories, as required, during the course.

Mr. Ken Griffiths, a Director of the College, acted as the overall training course co-ordinator. The Chief Instructor was Mr. Peter Gamble who was contracted from Holland College in Charlottetown. Mr. Gamble's previous experience, attained through participation in the PEI training program, proved invaluable in setting up and delivering the Newfoundland course. Mr. Gamble was assisted by several resident instructors of the College and a series of guest lecturers from government, the private sector and engineers from ShawMont Newfoundland Limited.

3.9.2 COURSE OBJECTIVES AND TOPICS

The first step in the development of the training program was a review of the course given by Holland College for the PEI pilot project. This review provided an opportunity to determine the adequacy of the Holland College program and establish to what extent it could be adapted for use in the Newfoundland project.

3.9.2 COURSE OBJECTIVES AND TOPICS (Cont'd)

Based on this review, review of other programs, discussions with EMR. and, in particular, the overall program objectives the following objectives were developed for the course:

(a) To develop the trainee's communications and motivational skills, understand current social science learning and decision making models.

(b) To establish the need for the conservation of energy and have knowledge about effective ways to do this. Understand the relative amount of savings different conservation practises will have and understand method of calculating simple payback.

(c) To provide knowledge of conventional and "energy efficient" construction details.

(d) To teach trainees how a building uses energy, establish where the energy is lost and quantify the relative amount of each loss.

(e) To provide trainees with a basic understanding of residential mechanical and electrical systems (space heating and domestic hot water).

(f) To provide the trainees with a simple, conceptual understanding of what the computer does with the information the advisor provides.

(g) To teach the trainees to be conversant with government programs which support energy conservation practices.

3.9.2 COURSE OBJECTIVES AND TOPICS (Cont'd)

(h) To encourage trainees to be good communicators and be able to research answers on his/her own.

(i) To provide a thorough understanding of the audit procedure and instruct trainees to be proficient in the performance of the procedure.

In conjunction with the development of the course objectives, a listing of important technical topics to be covered during the training course was also developed. Specifically, the topics included the following:

- Conventional house construction;
- Methods of heat loss and gain in a conventional home;
- Site specific influences on heat loss;
- Methods to conserve envelope losses;
- Conventional methods to replace energy loss (ie. mechanical systems);
- Ways to improve space heating system efficiencies;
- Methods to test mechanical systems;
- Residential electrical systems;
- Domestic hot water systems;
- Conservation measures for domestic hot water and electricity uses;
- Life-style conservation measures;
- "Unconventional" methods to gain energy, ie. active and passive solar, super insulated homes, wind generated power, heat pumps;
- Metric Standards Measures;
- Measurement of a House;
- General Overview of Micro Computer;
- Other topics to be integrated with the above.

3.9.2 COURSE OBJECTIVES AND TOPICS (Cont'd)

The following topics relating to communication skills and methods were also considered important;

- Orientation to Effective Listening;
- Adult Learning Theory;
- Adult Motivational Theory;
- Adult Decision Making Models.

3.9.3 COURSE PRESENTATION

The course was dissected in 50 Instructional Time Units of approximately three hours duration. These units were then assigned topics that met both the objectives and the main elements outlined during the planning stage of the course. In some cases where topics were of shorter duration, two topics were accommodated within an Instructional Time Unit. Figure 3.9.1 contains the final timetable for the course divided into the Instructional Time Units.

For each topic within the Instructional Time Units, a Topic Outline was established. This outline consisted of sections entitled Rationale, Elaborations and Methodology. Prior to the topic delivery, the rationale and elaborations for each topic were prepared. In most cases, a methodology for each topic was also prepared prior to the topic delivery, however, this was not always the case as many of the guest lecturers brought their teaching plan with them having previously agreed on the topic rationale and elaborations. The Topic Outlines are located in Appendix VII-A.

3.9.3 COURSE PRESENTATION (Cont'd)

The intent of including these Topic Outlines is not to submit a 'how-to' manual but simply to chronologically indicate the background methodology and expected results from the Training Program. Although it is hoped that this procedure will be of use in future regional programs or in the development of a national program, it is essentially a guide only. As was shown in the differences between Holland Collage and the College of Trades and Technology no two educational establishments will prepare and present their material exactly alike although they may use the same basic models of teaching and learning theories in the development of their programs.

The methodology section of each Topic Outline was evolved through input by those preparing the course and by those teaching the topics. Also one of the selected energy advisors reviewed the material and added comments relevant to how the material inputs have been synthesised to produce the two page Topic Outlines.

Figure 3.9.1 illustrates the distribution of instructional time by major topics. If the field time associated with direct communications learning is included with the communications component, the communications aspect will then represent closer to 15% of the total course time allotment.

3.9.4 CONCLUSIONS AND RECOMMENDATIONS

.1 Advisor's Course Assessment

All eight trainees were requested to provide ShawMont with an assessment of their recently completed residential energy advisor course. The students were asked to be critical of any areas in the course which they felt could be improved as such an assessment would be very valuable in making improvements for a possible credit course at the college. In consideration of the varied and diverse background of the trainees, it is interesting to note that there were several areas of common concern among the students.

(a) Computer Studies - Most of the students felt that more time should have been spent explaining in detail how the computer program analysed the data which was collected from the home. The students felt that, in some cases, a certain amount of data "manipulation" was required to improve the accuracy of the recommendations and energy costs for a home. There was a considerable amount of frustration experienced initially, by some students who entered incorrect data in certain areas of the computer program.

(b) Practical Applications - Most students felt that more time should have been spent in practical situations where they themselves were given an opportunity to work with equipment. As an example, the students felt that they should have been given an opportunity to actually apply door and window

3.9.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.1 Advisor's Course Assessment (Cont'd)

(b) (Cont'd)
weatherstripping and caulking, rather than simply look at samples in a classroom.

(c) Guest Speakers - Some concern was expressed regarding the number of guest speakers used during the course. In a limited number of cases, the students felt that the lecturer was either poorly prepared or had not been made aware of the overall objectives of the program. The most common occurence however dealt with a lack of intergration between different speakers and topics. The students felt they would have learned more from a guest lecturer had they, the students, been briefed as to the content of his lecture prior to the lecture time. In so doing, they could have prepared themselves for the speakers talk and would have been better prepared to ask appropriate questions.

(d) Course Length - Some of the students also felt that the course length was too short for the amount of material handed out. They felt the course should be offered over a two to three month period in order to adequately, learn and understand all that is required to be a good energy advisor.

3.9.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.1 Advisor's Course Assessment (Cont')

(e) Home Surveys - A number of the students felt that more time was required up front in the practice and delivery of the survey. Had more time been offered to them, students felt that they could have better prepared themselves for the delivery of the survey to a homeowner. Most students felt that a script or text should have been prepared as an example of how to properly deliver a survey. With such a script, the students felt that they could better practice amongst themselves in an empty house situation and over a period of time develop their own style for the survey delivery.

(f) Conclusions - Most of the above comments outline the somewhat negative areas of the training program, in particular, areas which students commonly felt that the course could be improved. It should be noted, however, that without exception, the students enjoyed the course and felt that they had learned a tremendous amount about energy conservation. Each student also indicated that they would be very interested in pursuing a career in the energy conservation field especially the nature of the work done by a Residential Energy Advisor.

3.9.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.2 Training Course Recommendations

The following recommendations encompass the above advisor's assessments with the assessements made by ShawMont in the Training Report SMR-8-83.

1. The use of guest speakers must be strictly controlled in order to ensure:
   (a) ability to lecture effectively, and
   (b) good lecture preparation

2. A text book should be prepared for the course.

3. A full time co-ordinator for the duration of the training course is essential to maintain continuity between lectures and to supplement materials relevant to the technical aspects of the course.

4. Course length should be extended by at least two weeks.

5. All trainees should be certified under the CGSB program upon completion of the course.

6. Emphasis on basic technical content must be maintained, more 'hands-on' experience would be useful.

7. The communications lecturer should also be closely involved with the development of the home survey communications approach.

3.9.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.2 Training Course Recommendations (Cont'd)

8. The course should make allowance for a greater practical involvement in home survey techniques.

9. The training course should not be offered as part of the regular curriculum of the educational establishment, due to its specialist nature.

10. Courses should be run when there is a requirement for advisors only. A stand-by list of advisors may have to be maintained.

11. The group(s) given the responsibility of running the audit program must have access to the preparation and delivery of the training course.

12. Research should be conducted into potential employment opportunities for residential energy advisors other than the group(s) responsible for running the audit program.

FIGURE 3.9.1

NEWFOUNDLAND AND LABRADOR HOME ADVISORY PILOT PROJECT

TRAINING COURSE

TIMETABLE

		MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
WEEK No. 1 1982-10-12 1982-10-15	AM	Legal Holiday	Day 1 College Welcome Introduction Audit Preview	Day 2 Home Survey (Full Shadow Load)	Day 3 S.I. Measurements & Technical Materials	Day 4 Audit Procedure (Computer Use)
	PM		Government Programs - Energy Mines & Resources - Mines and Energy	Survey Debriefing	Construction Technology (Envelopes)	Audit Procedure (Computer Use)
WEEK No. 2 1982-10-18 1982-10-22	AM	Day 5 S.I. and Material Thermal Properties C.G.S.B. Introduction	Day 6 Electrical Grid Power Home Use of Electricity	Day 7 Home Audit (Empty House)	Day 8 Heat Theory	Day 9 Construction Technology (Components)
	PM	Introduction to Domestic Hot Water Heating Systems	C.M.H.C. Presentation Communications	Audit Debriefing	Oil Fired Heating Units	Fire Codes & Prevention
WEEK No. 3 1982 10 25 1982-10-29	AM	Day 10 Home Audit (Computers)	Day 11 C.G.S.B. Presentation	Day 12 Home Audit (Empty House)	Day 13 Domestic Hot Water Consumption	Day 14 Demonstration/Site Visit Day
	PM	Space Heating With Auxiliary Equipment	Electrical Wiring and Appliances Communications	Audit Debriefing	Technical Materials and Interpretation	Demonstration/Site Visit Day
WEEK No. 4 1982-11-01 1982-11-05	AM	Day 15 Heat Flow (Infiltration and Ventilation)	Day 16 Education Package Presentation & Discussion	Day 17 Home Audit (Full Student Load)	Day 18 Moisture Problems in Homes Session I	Day 19 Retrofit Options
	PM	Energy Saving Components and Their Application	Preserved Basements Communications	Audit Debriefing	Moisture Problems in Homes Session II	Collecting and Analyzing Field Data
WEEK No. 5 1982-11-08 1982-11-12	AM	Day 20 Wind Energy Heat Pumps and Exchangers	Day 21 Wood Heat and Wood Management	Day 22 Home Audit (Full Student Load)	Legal Holiday	Day 23 Course Review
	PM	Solar Systems	General Discussion Session Communications	Home Audit (Full Student Load)		Course Review
WEEK No. 6 1982-11-15 1982-11 20	AM	Day 26 Operating costs and Payback	Day 25 Home Audit (Full Student Load)	Day 26 Evaluation Audits	Day 27 Evaluation Audits	Audition Selection
	PM	Government Assistance Programs	Audit Debriefing	Evaluation Audits	Evaluation Audits	Course Conclusion

3.10 COMMUNICATIONS

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3.10.1 INTRODUCTION

The importance of effective communications to the success of a residential energy audit program has become self evident both from the work carried out in the ENERPLAN program in Prince Edward Island and in the Newfoundland and Labrador Home Energy Pilot Project.

As Audit Delivery Systems Limited in Prince Edward Island performed much of the background research into communications concepts development, behavioural patterns and decision making models in relation to residential energy surveys, the ShawMont project team simply took the Prince Edward Island findings and methods and made adoptions and alterations, where necessary, either to suit the Newfoundland consumer or to improve the communication value of the component part. In essence, the communications program was divided into two areas: -interpersonal communications; and communications support

The first area, interpersonal communications, pertains to the relationship between advisor and homeowner. The second area, communications support, is concerned with the development and testing of an information package to increase participant awareness and understanding of the program such that, ultimately, it will assist the homeowner in the adoption of energy conservation as a personal and/or family lifestyle goal.

3.10.2 INTERPERSONAL COMMUNICATIONS

The importance attached to effective communications was clearly demonstrated in Prince Edward Island hence the ShawMont project team oriented the selection criteria of trainee advisors to the that of good communication ability. Although difficult to qualify and often susceptable to subjective preference, the search for individuals with effective communication skills proved successful. The elements of our program pertaining to communications were:

.1 Selection of Trainee Advisors

The primary selection criteria was the ability to communicate, hence the selection process (Section 3.8) was geared to personal contact procedures in the form of screening interviews to gauge potential trainees response on initial meeting under stress conditions. Those identified as having some potential were then given a second interview of 15 - 20 minutes involving a panel of three adjudicators using well established interviewing techniques for evaluating communication skills (eye-to-eye contact, addressing the whole group, confident but not overly friendly, honesty in reply, etc.).

.2 Training of Advisors

One session per week of the training program was devoted to focusing the trainees' already established communications skills into the requirements of the program in terms of; homeowner needs, principles of communications, role-playing situations, group analysis and self-criticism.

3.10.2 INTERPERSONAL COMMUNICATIONS (Cont'd)

.3 Evaluation of Trainees

The evaluation surveys carried out at the conclusion of the training program demonstrated that the communicative element was of prime importance. However, due to the technical requirements of the surveys, those students who had mastered the technical elements tended to be more aware of their communication duties to the homeowner. Hence although all the trainees were successful communicators, only those who grasped the technical skills required within the four weeks could more easily concentrate on interaction with the homeowner. This would lend more support to the requirement that the training course be extended to allow more time for the mastering of the technical aspects of the program such that the trainees would be more comfortable in their dealings on technical matters. To simply increase the communication portion of the training course would not significantly improve the trainees communicative abilities if they were still under pressure from insufficient time to digest and understand the technical requirements of the job.

.4 Main Pilot

Following the initial two to three days of the pilot, the four advisors settled down to show excellent rapport with the homeowners as evidenced in the homeowners ratings of the advisors work. (Table 4.1.3). Advisors began to encourage

3.10.2 INTERPERSONAL COMMUNICATIONS (Cont'd)

.4 Main Pilot (Cont'd)

homeowners to discuss energy conservation as they (the advisors) became increasingly more confident in the recommendations that they were making. Unfortunately, the main pilot was not of sufficient length to examine whether the advisors would become complacent to their recommendations and tend to instruct rather than advise. Future pilot programs or the main program may require a periodic refresher session for advisors to discuss communications problems and help them recognise when and where problems might occur.

3.10.3 COMMUNICATIONS SUPPORT

The communications support program contained six distinct elements divided into three time phases within the program. As shown below, the elements were structured for use prior to, during and after the survey.

Phase I
Pre - Survey
Letter of Introduction
Pre-Appointment Brochure
Phase II
Survey
Sample Kit
Homeowner Information Kit
Phase III
Post Survey
Follow-up Package
Homeowner Questionaire

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.1 Graphics Design

The logo design and project title was prepared by Saga Communications Limited as best describing the project in relation to the existing national programs and its relevance to the home and its occupants. The graphics were incorporated onto literature sent to the homeowner to reinforce the programs orientation with the participants. The use of all family members in the logo design typified the need for family lifestyle adjustments to conserve energy.

.2 Letter of Introduction (Appendix VIII - A)

The letter of introduction was designed to give the homeowner enough information on the objectives of the program such that an informed decision on whether to respond to the invitation was worthwhile. The letter was put on Company letterhead to reassure individuals that this program was managed by a reputable local company rather than the product of anonymous solicitation.

The letter was accompanied by a Home Energy Advisory Appointment Request Form (Figure 3.5.1) and a prepaid envelope. Three different letters were prepared for the three regions to be surveyed - St. John's and environs, Gander and Happy Valley - Goose Bay.

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.3 Pre-Appointment Brochure

This document had few changes from the brochure used in Prince Edward Island. The brochure was designed to:

- describe the Home Energy Survey
- identify the main elements of the survey and what will be required of the Homeowner.
- act as a reminder of the survey appointment.
- establish a prior connection between the homeowner and the advisor.

Basically, the program introduction was changed to emphasize the cost saving element involved in increasing energy efficiency. Also key descriptor words or phrases in the text were highlighted to indicate their importance to the smooth running of the survey. According to the survey of homeowners conducted after the home energy survey (Appendix IX-B) over 70% of those responding found the brochure helpful. However, the advisors reports indicated that approximately 31% of homeowners did not have fuel bills available which would indicate that there was some lack of clarity in the pre-appointment brochure.

.4 Energy Products Sample Kit

Each advisor was equipped with an energy product sample kit contained in a compartmentalized attaché case. These kits were used to show homeowners the products available, as well as

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.4 Energy Products Sample Kit (Cont'd)

their proper use in assisting in the reduction of energy consumption. Each kit contained the following products:

(a) Insulation - The three most common types of residential insulation, namely fiberglass, celulose and rigid board were included.

(b) Weatherstrip - Homeowners were also shown available door and window weatherstrip. Samples included foam roll weatherstrip, wood and foam weatherstrip and door sweeps.

(c) Air Infiltration Sealants - As part of the display of air infiltration sealants each kit contained silicone caulking, putty cord, sealing tape and plug, switch and fixture gaskets.

(d) Water Flow Restrictors - The final item contained in the kit was a shower head flow restrictor courtesy of Newfoundland Light and Power Co. Ltd.

At each house, either an outlet gasket or flow restrictor was presented to the homeowner, as the first step toward energy conservation and to strengthen the positive interaction between homeowner and advisor.

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.5 Homeowner Information Kit

The information kit was the major item of communications support and consisted of a number of separate elements that all had specific objectives in aid of encouraging homeowner participation in energy conservation. The contents of the kit were retained in a three ring binder to improve the ability for information retreival and organization by the homeowner. Also the folder proved to be a very effective giveaway and cemented a significant link to the program in terms of its attractiveness and physical presence. After the survey was complete over 96% of these homeowners responding to the questionnaire found the information kit helpful (Appendix IX - B).

(a) Home Energy Survey - The principle article in the kit was a fold-over card quality document with program logo and space for the homeowners name on the front cover. It was designed to be used either as part of the complete kit or in isolation as a separate document to show to retailers, tradespeople and contractors about the energy characteristics of their home. The inner faces of the fold over sheet described the program and the possible recommendations and listed a variety of regular energy conservation practices that the homeowner may find beneficial.

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.5 Homeowner Information Kit (Cont'd)

Stapled to the fold over sheet was the Survey Results Sheet (Figure 3.7.2). This was produced on NCR paper in order to retain a copy for the project office records. The sheet was expanded to accomodate all information on one sheet and to allow the advisor space to describe various measures and recommendations in more detail. Homeowner maintenance advice was added to the sheet to ensure that a copy of specific recommendations was available for reference should the homeowner have some recourse as to what was suggested. The extra space allowed a column to be added that indicated whether or not a particular recommendation was applicable for funding under a government program. The only item not included was the optional wood heat recommendations due to lack of preparation time prior to printing. The results sheet was designed to be folded such that all the basic data was contained on the front face of the paper and the recommendations and descriptions were located on the fold out.

(b) Home Energy Savings Guide (Cornerstones) - This publication was supplied as part of the kit and was used by the advisor to illustrate types of energy savings practices that may be relevant to the homeowner based on the recommendations produced by the

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.5 Homeowner Information Kit (Cont'd)

Computer. The Home Energy Savings Guide was punched to allow insertion into the folder and the government program brochures fit in a pocket in the folder.

(c) Government Program Pamphlets - Pamphlets describing both the Canadian Home Insulation Program and the Canada Oil Substitution Program were made available to the homeowner. The advisor discussed various aspects of each program in reference to the pamphlets and their relevance to the homeowner's requirements.

(d) Directory of Products and Services (Appendix VIII - B) - As part of the Homeowner Information Kit, ShawMont personnel assembled a directory outlining companies in Newfoundland and Labrador which were available to provide energy conservation products and/or services. Included were companies who retailed such goods as insulation, weatherstripping, fuel efficient furnaces, wood stoves, etc. and companies providing services such as installation of insulation, furnace tuning and energy analysis. The directory was designed to assist and direct the homeowner to possible sources of energy conservation products and services.

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.5 Homeowner Information Kit (Cont'd)

(e) Give Away - A decal for adhesion to a suitable surface was developed based on the Energy Conserving Practices checklist. It was essentially a vehicle for reinforcing the energy conservation awareness after completion of the survey. As to the value of this article in terms of increased program awareness, there did not appear to have been too many homeowners who wished to stick them on their wall.

.6 Follow-up Package

In order not to overload the homeowner with energy conservation information, a follow-up package was mailed within 10 days of the survey. The package consisted of publications which the advisor thought would be relevant to the homeowner and of publications specifically requested by the homeowner. The publications were all punched for easy insertion in the three ring binder. Publications that were used as follow-up material were:

- Keeping the Heat In - EMR
- Bill Payers Guide to Furnace Servicing - EMR
- Switching to Electricity (Labrador only) - EMR
- Solar Hot Water - A Homeowners Guide - EMR
- CHRP Brochures - CMHC
- Condensation in the home - CMHC
- How to Hire a Contractor - CMHC
- Heating with Wood Safely - CMHC

3.10.3 COMMUNICATIONS SUPPORT (Cont'd)

.7 Homeowner Questionnaire

Included in the follow-up package was a short questionnaire for the homeowner to complete and return. The questionaire was returned by 51% of those surveyed during the whole program (127 households) and the results of the survey are located in Appendix IX-B.

3.10.4 CONCLUSIONS AND RECOMMENDATIONS

To accurately assess whether the communications program was totally effective is difficult. The homeowner questionnaire indicated that a large percentage of those homeowners returning the questionnaire felt that the advisors were either good or excellent in their survey work indicating that the advisors achieved success in their interpersonal contact with the homeowners.

In relation to the communications support most respondents felt that the information was helpful, however, the only test of effectiveness would be another visit to the home (to ensure 100% response) to discuss the effects of the program in six months or a year's time. The use of the three ring binder won obvious acceptance from the homeowner and the survey results sheet was more effective because of its increased size. The giveway decal was of no consequence at all.

3.10.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

To say that the homeowner will be totally influenced by informed statements about energy and money savings supplied by qualified individuals may be too simplistic a statement. The requirements of comfort, lifestyle, perceived maintenance of living standards all may act against the adoption of common-sense energy saving measures. Also, the type of homeowners who were part of the sample survey were, by and large, people receptive to new ideas and change by virtue of their willingness to take-up the offer of a home energy survey. It is possible that a variety of communications devices may be required for use on a major program in order to reach varying lifestyles, income groups, awareness levels, etc. The television may be a more effective vehicle to increase awareness of a national program.

Specifically, the following recommendations emerged from the communications aspects of the program.

.1 Interpersonnel Communications

- The ability to communicate effectively is the number one selection criteria for advisor trainees.

- It is not necessary to increase the communications training in the classroom time but to increase the field time in communications i.e. more 'real' audits, with the communications instructor having closer involvement with both the field and classroom activities.

3.10.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.1 Interpresonnel Communications (Cont'd)

- The amount of time spent on technical details in the classroom should be increased to allow the trainees to be more confident of the technical aspects of the survey and hence more able to be effective communicators.

- Advisors should phone homeowners the day prior to the survey and recap the main points of the survey.

.2 Communications Support

- The pre-survey brochure must be more effective in its explanation of the program.

- The main publication on energy savings methods should be Canadian and designed such that certain sections could be interchangeable and devoted to region-specific pecularities, whether to do with climate, construction practices, standards, etc.

- Ensure that the products displayed in the sample case are readily available locally. In St. John's some products displayed had very little circulation in local stores.

- The three ring binder presentation for the Homeowner Information Kit should be adopted for a main program.

3.10.4 CONCLUSIONS AND RECOMMENDATIONS (Cont'd)

.2 Communications Support (Cont'd)

- If the giveaway concept is to be retained, something more meaningful than a decal is required. Perhaps the giveaway should be geared to particular segment of the population ie. children.

- The development of a structural communications program must ensure that the main program will receive take-up support from the general public within the capabilities of the group(s) selected to effectively administer the program.

- The communications program must be the responsibility of a reputable public relations/-marketing company.

PART FOUR

FIELD TESTING AND

DATA MANAGEMENT

PART FOUR - FIELD TESTING AND DATA MANAGEMENT

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4.1 INTRODUCTION

The most important component of the Newfoundland Pilot Study was the execution of the main pilot and the subsequent analysis of the data collected through the field test. Prior to the commencement of the main pilot field test there had been a considerable amount of important developmental work completed. The Prince Edward Island procedure had been reviewed, modified, and tested to accomodate Newfoundland Specific Data; energy advisors were selected and trained to carry out residential energy surveys and potential typical Newfoundland housing stock had been identified for the field test. In short, everything was now ready to accomplish one of the main objectives of the Newfoundland Pilot Study which was to assess the potential of a residential energy advisory service for the province of Newfoundland and Labrador. The following sections outline the work which was carried out during the main pilot field test.

4.2 IMPLEMENTATION OF THE MAIN PILOT

4.2.1 General

Whenever possible the advisors were requested to plan their surveys at least three days in advance of actual appointments. Each advisor was made responsible for ensuring that all the equipment was maintained and working properly. They were also responsible for ensuring that an adequate supply of communications materials and miscellaneous supplies such as camera

4.2.1 General (Cont'd)

film, batteries and stationery were available at the base office at all times. Typically, the advisors would check in with the base office twice weekly. During these periods, they would check with the dispatcher to pick up their appointment forms and replenish stationary and communications material. The advisors carried out two surveys a day, each requiring approximately three hours to complete. The morning surveys were typically scheduled to start at 0930 hours while the afternoon surveys commenced at 1330 hours. Both these times were selected to prevent interference with the breakfast and lunch meals while still allowing time to complete the survey before the next meal. Surveys were carried out on the first four days of each week. The fifth day (Friday) was reserved for an audit de-briefing session and the mail out of information brochures to households surveyed during the current week. At the end of the main pilot, all pertinent data collected during the main pilot was reviewed and compiled into a data base management system.

4.2.2 Selection of Houses

The selection criteria outlined in Section 3.5 was used to select homes for the Main Pilot. In summary, the Newfoundland Housing Stock was classified primarily by house type and age of construction. Site surveys were carried out in St. John's and Gander and a telephone conversation with the Energy, Mines and Resources representative at Goose Bay to identify:

4.2.2 Selection of Houses (Cont'd)

- areas of high concentration of single detached dwellings;
- areas with varied sample housing types; and
- areas of various house age.

Following the site visits, Category one selection criterias was used to select small geographical areas of St. John's, Gander and Goose Bay for direct mail solicitation to attract potential homeowners to apply for a residential home survey. (Figure 4.1).

The homeowner solicitations, consisting of an introductory letter, a home energy advisory appointment request form and a self addressed stamped return envelope, were delivered on a bulk mail basis in the respective areas. Table 4.1 contains a summary of responses to the mail solicitation. As indicated in Table 4.1, four (4) distinct areas of the city of St. John's were chosen. Specifically, postal route numbers 28, 52, 62 and 69 were identified as areas having high concentrations of typical Newfoundland housing stock. (Figure 4.2). Petty Harbour was chosen for mail solicitation because of its close proximity to St. John's and because it contained housing stock considered to be typical of a Newfoundland rural community.

Two other major centers of the province were chosen for field testing of the audit procedure. Gander was chosen because it is exposed to climatic conditions which are considerably different from those experienced in St. John's (Figure 4.3). Goose Bay is exposed to a severe

4.2.2 Selection of Houses (Cont'd)

climate typical of what might be expected in two other ECAP regions of Canada, namely the North West Territories and the Yukon.

Completed application forms were screened using the category two selection criteria outlined in Section 3.5 and potential homes were identified. Homeowners were contacted by phone and appointments were made to have a home survey carried out by one of the advisors.

A dispatcher system was implemented to ensure that an effective procedure was maintained for booking survey appointments. Figure 4.4 contains a flow chart outlining the tasks carried out by the telephone dispatcher. Selected homes were placed in a main file and sorted according to preference for selection based on the housing stock criteria. The dispatcher then called up each homeowner using the script outlined in Figure 4.5. If a mutually convenient time could be established to have the survey carried out, the dispatcher was responsible for filling out an audit appointment form and mailing the homeowner a pre-appointment brochure. If a homeowner could not be reached or a mutually convenient time could not be established, the dispatcher placed the survey request form in a holding file for possible future contact. Homeowners were typically contacted two weeks prior to the planned survey for scheduling purposes.

4.2.3 Procedure for Carrying Out a Survey

After the dispatcher had set up a convenient date to have the home surveyed, a "Home Energy Advisory Appointment Request Form" was completed and the pre-audit

4.2.3 Procedure for Carrying Out a Survey (Cont'd)

brochure was sent to the homeowner by mail approximately one week in advance of the appointment. The brochure entitled "Preparing for Your Home Energy Survey", summarized points previously discussed on the phone with the dispatcher and provided the homeowner with information on how to prepare for the home survey.

The appointment request forms were then given to the energy advisor typically two or three days ahead of the survey. This lead time permitted the advisor to prepare for his surveys in advance. The advisors were responsible for contacting the homeowner 24 hours prior to the appointment for re-confirmation and further details as required. This was also done to minimize the possibilities of last minute cancellations.

Upon arrival at the home, the advisor was requested to follow the procedure established during his training course wherever possible. Figure 4.6 contains an advisors survey sequence flow chart for reference purposes. As shown in Figure 4.6, the home survey typically involved the following steps:

.1 Introduction/Interview

The advisors were instructed to first of all introduce themselves to the homeowner and request permission to both take photographs of the home and bring the equipment into the home. The picture would be used later in the survey in establishing and quantifying architectural features of the house. Once inside the home, the advisor would sit down with the homeowners and introduce the pilot

4.2.3 Procedure for Carrying Out a Survey (Cont'd)

.1 Introduction/Interview (Cont'd)

project. Information was presented on the background and objectives of the project and a brief description of what the advisor would be doing in the home was given. The homeowner was then interviewed to obtain basic data on water consumption, thermostat setting, heating system, moisture problems, energy use, and energy costs.

.2 Data Collection

After the interview the homeowner was requested to accompany the advisor on an inspection of the home. The advisor established the overall dimensions of the dwelling and carried out a room by room inspection. Architectural features of the home were measured and classified as to type, fit, orientation and sealing. Any wall, floor or ceiling penetrations around windows, doors, pipes and outlets were noted and potential maintenance problems were pointed out to the homeowner. The advisors were also trained to identify moisture problems such as milldew in cold corners, heavy fogging on window panes or staining and rotting of window sills. Where possible an inspection of the attic was carried out to determine present insulation conditions, the potential for more insulation and possible maintenance problems such as moisture damage to rafters and sheathing.

4.2.3 Procedure for Carrying Out a Survey (Cont'd)

.2 Data Collection (Cont'd)

A complete inspection and combustion efficiency test was carried out on oil fired heating systems. Reading on CO_2, smoke number, stack temperature and draft were used to determine the unit's operating efficiency. Model numbers, age, and operating characteristics such as nozzle size and BTU output were also recorded. Any maintenance problems were also pointed out to the homeowner. The hot water temperature was measured from a tap using a digital thermometer and the potential for flow restrictors was established. Checks on thermostat calibration were also carried out.

.3 Computer Data Entry

All pertinent data collected during the survey was entered into the micro-computer. The computer first stored the information and then carried out a complete data analysis for the home. Upon completion, a list of priorized recommendations was produced which provided the homeowner with such information as the contractor cost, do-it-yourself cost (where applicable), energy saving, and the resultant payback. If the homeowner was interested in wood heating the advisor would run the wood heat subroutine. The computer would establish the space heating requirement of the home and determine the size of wood stove or furnace that should be considered for conversion. The homeowner was also given an estimate of how much wood he could expect to burn to meet 25%, 50%, 75% and 100% of space

4.2.3 Procedure for Carrying Out a Survey (Cont'd)

.3 Computer Data Entry (Cont'd)

heating requirements of the home. Estimates for the cost of conversion and the associated paybacks were also provided. A similar subroutine was available for conversion from oil to electric space heating, however, due to the present COSP regulations, this conversion is only funded in Labrador.

.4 Presentation of Recommendations

The priorized recommendations produced by the micro-computer were displayed under four main categories: insulation, sealing, heating system and hot water system. The advisor was responsible for transferring the information from the computer screen to the appropriate category on the home energy results sheet. The information was the presented to the homeowner by taking time to fully explain what was involved in each recommendation as well as the anticipated savings. A description of government assistance programs available to the homeowner was also provided. Following the presentation of results the homeowner was presented with a homeowner information kit. The advisor briefly outlined the information contained in each of the brochures and noted areas in which the homeowner was interested in receiving further follow up information.

The advisor was responsible for reviewing all data sheets completed during the survey to check for completeness and accuracy. He also filled out an advisor's report form for each of the survey's.

4.2.3 Procedure for Carrying Out a Survey (Cont'd)

.4 Presentation of Recommendations (Cont'd)

This was typically done at home or in the base office.

4.2.4 Advisor De-Briefing Sessions

The advisors were required to participate in a de-briefing session that was held each Friday morning. During the session, representatives from the project team plus the four advisors discussed the surveys performed that week. Each advisor was requested to give a short summary of the eight surveys completed. They were also given the opportunity to ask questions on problems which may have occurred in any aspect of the procedure. During the de-briefing sessions, members of the project team reviewed the data file for each survey to ensure that all required information had been collected and to ask questions on questionable data. The de-briefing sessions normally took three hours to complete. Prior to the commencement of the de-briefing, the advisor's were requested to complete a Home Survey Analysis Sheet. This sheet was used by members of the project team to monitor the time spent on the different aspects of the survey and thereby identify potential problems in the advisor's delivery technique. At the beginning of each de-briefing session, a comparison table of the time required per advisor and survey for each of the four main components was placed on the chalkboard. This provided the advisors with an opportunity to identify the areas in which they should be spending more or less time.

4.2.5 Data Filling and Mail-Outs

The advisor spent Friday afternoon at the base office filling the survey data files for that week and making preparations to mail-out the follow-up information requested by each homeowner. They also carried out maintenance on the equipment as required and made the necessary arrangements to carry out the surveys for the following week.

4.3 ANALYSIS OF THE MAIN PILOT

4.3.1 Selection of Residences

Generally speaking the residence selection procedure was effective in canvassing, selecting and surveying typical homes in Newfoundland and Labrador. As can be seen in Table 4.1, of the 1,553 applications mailed, 215 were received by the project team for a response rate of 14%. The return rate varied between a high of 24% for area #28 in St. John's to a low of 7% for Petty Harbour. Area 62 in St. John's also had a low return rate of 8%. It was initially hoped that these two areas would have high return rates as they contained specific house types (ie. attached dwelling and rural house types) which were considered typical of the older housing stock in the province. It is uncertain as to why the response rates were low for these two areas however it would appear that more applications will have to be mailed in areas containing older housing construction (pre 1940) to obtain desirable response rates.

4.3.1 Selection of Residences (Cont'd)

As shown in Table 4.2, it would appear that the housing selection criteria was very effective in identifying typical Newfoundland housing stock. With the exception of space heating characteristics, there is a very high correlation between the characteristics of housing stock identified in the Housing Stock analysis and the characteristics of housing stock survey during the pilot. With respect to space heating characteristics there was a deliberate attempt to survey more homes with oil fired space heating as the emphasis on COSP is on conversion from oil fired space heating. Table 4.3 compares the number of homes surveyed with the number of applications received for each area. As shown in Table 4.3, 133 homes were surveyed during the training program and the main pilot. Of this number, 101 homes were surveyed during the main pilot.

.1 Homeowner Contact Problems

A number of problems were experienced with the dispatcher system used in pilot study. The following is an outline of the different problems experienced in each area:

(a) St. John's - A total of 104 applicants were contacted before the dispatcher could fill the seventy- two (72) appointments available for St. John's and Petty Harbour. A total of 32 appointments could not be made by the telephone dispatcher. The following is a listing of the most common reasons why an appointment could not be made.

4.3.1 Selection of Residences (Cont'd)

.1 Homeowner Contact Problems (Cont'd)

Reasons Why Survey Appointment Could Not Be Made by Dispatcher

	# of Occurences	%
- No Contact (ie. line busy, no answer, individual not at home)	20	63%
- Not available during normal survey hours	9	28%
- Declined	3	9%
TOTAL	32	100%

Of the 72 original appointments made by the telephone dispatcher only 68% or 49 homes were actually surveyed during the Main Pilot. The remaining 32% or 23 homeowners cancelled their appointment. Three common reasons were used by homeowners who cancelled their survey as indicated below:

Reasons why homeowners cancelled their survey

- No longer available (homeowner could no longer have the home surveyed at the prearranged time and date)	19	(82%)
- No one home at the appointment time	2	(9%)
- No longer interested in the survey	2	(9%)
TOTAL	23	(100%)

4.3.1 Selection of Residences (Cont'd)

.1 Homeowner Contact Problems (Cont'd)

(b) Gander - A total of 25 applicants were contacted before the dispatcher could fill the 20 appointments available for Gander. A total of 5 appointments could not be made by the telephone dispatcher. In four cases, the dispatcher could not contact the individual. In the other case the individual was not available during survey hours.

Of the twenty original appointments made by the telephone dispatcher 95% or nineteen homes were actually surveyed during the Main Pilot. One homeowner had to postpone his appointment until a later date. The opening was filled by another homeowner selected from a list of applicants who indicated they would be available on short notice to have a survey carried out.

(c) Happy Valley - Goose Bay - A total of 12 applicants were contacted before the dispatcher could fill the 9 appointments available for Goose Bay. A total of 3 appointments could not be made by the telephone dispatcher. In all three cases the dispatcher could not contact the individual (ie line busy, no answer, individual not at home) to set up the appointment.

4.3.1 Selection of Residences (Cont'd)

.2 Conclusion

By far the most common problem encountered by the dispatcher was the no-contact problem. This resulted when the dispatcher tried to contact the homeowner a minimum of three times and for one reason or another, (ie. busy signal, no answer or person not available) the contact could not be made. Consequently the application was placed in a hold file. A second common concern was the high rate of cancellation of confirmed appointments. This problem was most serious in St. John's. In fact by the end of the study, houses had to be solicited from known contacts within the company to ensure that adequate numbers and types of houses were examined. These are the houses shown as "other" in Table 4.3. This could have been a serious problem but early in the program, when it appeared that the cancellations might affect the project, a list of homeowners who would be available on short notice was drawn up. This restricted the number of unfillable appointments to 4.

4.3.2 Survey Procedure

The analysis of the main pilot survey procedure is based primarily on data obtained from the Advisor's Report Forms and the Follow-up Questionnaire sent to homeowners after the pilot project. The analysis of the advisor's report forms was based on 84 reports (101 homes surveyed) completed during the main pilot. The analysis of the Homeowner questionnaires was based on a response rate of 51.2% (65 returned questionnaires from 127 mailed). Sample data forms containing the response rate and frequencies can be found in Appendix IX.

4.3.2 Survey Procedure (Cont'd)

.1 Overall Evaluation

The majority of homeowners responding to the survey, (58.7%), stated that the visit was informative, but much of the information provided was already known to them. Ancther 39.7% reported that the visit was extremely useful and provided them with information they would not otherwise have known.

Table 4.4 shows homeowners' ratings of the energy advisors' work and general approach. Most respondents (70.3%) rated the energy advisors excellent in terms of being helpful and courteous. Comments were split between good (48.4%) and excellent (40.6%) on how well informed the advisor was on topics the homeowner thought important. Over 90% of the respondents found the advisor above average in regards to ease of understanding and careful in their work.

Approximately two-thirds of respondents stated that the survey method was more detailed than they expected and almost all (95.2%) felt that the survey method was thorough enough to accurately assess their house. Most homeowners (78.1%) thought that the total time required for the advisor's visit was adequate to conduct and discuss the survey. Another 12.5% did not think the time was long enough and 7.8% stated that the time required was unnecessarily long.

4.3.2 Survey Procedure (Cont'd)

.1 Overall Evaluation (Cont'd)

Of a sample of 60 homeowners, all felt that the advisor's presentation helped to make the information easy to understand. Over 90% of homeowners stated that the advisor's presentation was helpful in showing them a more effective approach to energy conservation.

Almost half the respondents found the brochure they received before the advisor's visit somewhat helpful and approximately 22% found it very helpful. It should be noted that almost 27% of homeowners reported that they did not receive a pre-appointment brochure.

Approximately 89% of homeowners in a group of 61 who responded, stated that the advisor's visit conformed to their expectations based on pre-survey materials received and/or the pre-survey phone call from ShawMont. Of the 11% who stated that the visit did not conform to their expectations, the following reasons given were: more testing was expected; it took more time than expected; more informative than expected; use of house plans instead of visual inspection and no attention paid to heat loss from electrical outlets or fireplace.

.2 Pre-Survey Preparation and Interview

According to the analysis of the advisor's report forms, most homeowners were adequately prepared for the energy audit. In 83 cases, the homeowner was expecting the auditor and most (91.7%) had a good

4.3.2 Survey Procedure (Cont'd)

.2 Pre-Survey Preparation and Interview (Cont'd)

understanding of the purpose of the survey. Approximately 31% of homeowners did not have fuel records sorted and ready and in some instances numbers had to be estimated. This lack of preparation is reflected in a later question when advisors are asked if the interview was impaired by distractions or delays. In a sample of 83 homes, approximately 19% of interviews were delayed and in many cases advisors mention that time was wasted looking for fuel records. The decision maker was present in 84.5% of cases, but often only present while data was being entered into the computer or when recommendations were being presented.

All homeowners were reported to have understood the need for interview questions and only 2.4% were confused by questions. The advisors reported that they thought 94% of the information on insulation values of walls and attics provided by the homeowner, was accurate.

To summarize, in the Pre-audit Preparation and Interview section, the most significant finding was the percentage of homeowners not having their fuel records sorted and ready (30.9%).

.3 Measurement and Inspection

In most cases, the advisors did not have any difficulty measuring and inspecting homes. The houses' perimeters were calculated, windows and

4.3.2 Survey Procedure (Cont'd)

.3 Measurement and Inspection (Cont'd)

doors were measured and evaluated, and moisture problems were sourced without difficulty in over 95% of cases. It was possible to inspect the attic or crawl spaces in 78.6% of cases. Advisors reported that some attics were inaccessible due to the height from floor or a blocked entrance which the homeowner was not willing to move.

A furnace efficiency test was performed in 88% of homes. Some of the reasons for not performing this efficiency test were the presence of electric heat, combined heating types and intermittent furnace operation. In almost all of the audits (98.8%) it was possible to identify and assess contributions from other sources of heat other than the oil burner.

Only 6% of houses possessed maintenance problems which would considerably affect the conservation potential of the house. House data was recorded on forms without trouble and there were very few problems resulting from a lack of equipment (3.6%) or any other problems experienced in performing the inspection and measurement part of the survey (4.8%). In 91.5% of these surveys, the homeowner followed the advisor for the majority of the inspection. Some of the reasons stated for not following the auditor were: homeowner was in a wheelchair; had to lock after children; and had business work tc do.

4.3.2 Survey Procedure (Cont'd)

.4 Computer Hardware and Software

In all but one survey, the computer accepted all the inputs. The incidence of computer related problems affecting completion of the survey was 16.9%. These problems included: problems with the program and inability to get recommendations, assumed units for heating section were set up for kilowatts, and heat from a nearby wood stove adversely affected the program. Advisors were asked whether the costs, savings and priority of recommendations correlated with their intuitive deductions. In 90.2% of cases, the computer recommendations corresponded with advisors' deductions. Differences were identified as too low or too high costs on computer recommendations and also insignificant measures receiving a high priority. The advisors stated that some recommendations were misplaced or omitted in 14.6% of the survey. In several instances, the perceived omitted recommendation was insulation of the attic or basement. The woodheating routine was utilized in 24 of 83 surveys. Advisors reported that the routine addressed the homeowners' need for information on woodheating in 87.5% of cases.

.5 Results and Conclusions

Approximately 60% of homeowners in a group of 63 who responded to the homeowner questionnaire, reported that the advisor found problems that the owner was not previously aware of. Of these problems, furnace efficiency was mentioned in 50% of

4.3.2 Survey Procedure (Cont'd)

.5 Results and Conclusions (Cont'd)

cases. Other problems which the advisor made the homecwner aware of were: draft or heat loss areas, lack of insulation, excessive hot water temperature, and moisture and ventilation problems.

According to the questionnaire respondents, homeowners appeared to be attentive and receptive in 97.4% of cases when advisors presented survey results and recommendations. Information on government programs was requested in 83.8% of eighty surveys while only 38.8% of hcmeowners requested information on contractors for retrofit work.

Approximately 72% of the respondents stated that the information received on available government grants for energy conservation measures was very helpful in providing them with information on programs available for funds. Almost 20% stated that the information was somewhat helpful but they were still unsure as to whether or nct they are eligible.

Of the total number of recommendations received from the survey, 25.4% of hcmecwners stated they would carry out approximately 51-75% of recommendations, 23.8% would carry out approxiamtely 26-50%, 17.5% would carry out approximately 1-25% and 12.7% would carry out approximately 76-99%.

4.3.2 Survey Procedure (Cont'd)

.5 Results and Conclusions (Cont'd)

In comparison, the percentage of recommendations that advisors estimated the homeowner will adopt, range from 0-100% with the majority estimated at 70% or more. Advisors stated that 76.9% of 78 homeowners were, by the time they left, "convinced the savings are worth the investment and will take action for this winter".

Of the 62 homeowners who returned the questionnaire, 80.6% felt that their home's energy cost or consumption will decrease this winter as a result of the advisor's visit and their actions. Of these homeowners, 45.1% estimated a 5-10% reduction and 43.1% estimate a 10-25% reduction in energy costs for this year.

Over 90% of homecwners felt that a home energy advisory service of this sort is needed by Newfoundland homeowners. Approximately 83% of surveyed homeowners would recommend the Home Energy Advisory Service to others. Another 12% would recommend the service with some reservations and almost 5% stated that they would not recommend the service to other. Some of the reasons given for not recommending the service were: well informed consumers would receive limited value from the service; more accurate equipment is needed to detect heat loss around doors and windows; and inspection may not be complete enough using house plans instead of a more detailed on site investigation.

4.3.2 Survey Procedure (Cont'd)

.5 Results and Conclusions (Cont'd)

Just over one half of a sample of 62 homeowners would be willing to pay for an energy survey of their homes. Of those who stated how much they would be willing to pay most (89.3%) reported $50 or less. The responses ranged from $10.00 to $200.00. Most homeowners indicated they would be willing to pay $50.00.

A graphic analysis of the time spent in each part of the survey by each advisor is presented in Figure 4.7. The interviews ranged from 15-55 minutes in length, with B. Dunne and R. Mackey spending the most time of all advisors in this section. The average inspection and measurement period took approximately 78 minutes with the majority taking 60, 70 and 75 minutes. One advisor, B. Dunne spent between 115 and 180 minutes completing the inspection and measurement section. The average time spent on computer inputs and writing recommendations was approximately 33 minutes with two surveys by R. Mackey and one by T. Cook taking 60 minutes to complete. The presentation of survey results averaged approximately 28 minutes per visit with six presentations lasting more than 45 minutes.

4.3.3 Advisor De-Briefing

The Friday morning de-briefing sessions were a very important aspect of the main pilot. During these sessions the advisors were encouraged to ask questions

4.3.3 Advisor De-Briefing (Cont'd)

on problems which they may have had during the previous week. Quite often the problems discussed were common to a number of advisors and as such they were able to both discuss and offer solutions to the problem based on individual past experience. There were a variety of types of problems discussed all considered to be of a minor nature. Most concerned the use of equipment or problems encountered in formating data for entry into the computer.

4.4 DATA BASE MANAGEMENT PROGRAM

As part of the initial terms of reference for the contract a housing stock data base was required for delivery to the client. The purpose of this housing base was to:

(1) allow for data reduction of specific types of housing information such as housing age;

(2) allow for data comparisons between different data bases such as between Prince Edward Island and Newfoundland and most importantly;

(3) allow for simplified data correction of all housing information within a specific data base.

As a result a specific data base management software package was developed to be used by all pilot projects and was released to the Newfoundland Pilot Program in early January 1983 in the form of program listings (Appendix X).

4.4.1 Editing Software Description

There are three components to the data base management system software. These are MAKEFILE.BAS, DATAEDIT.BAS and EDIT.DAT. The first two are BASIC files while the last one is a data file which is produced as a result of MAKEFILE.BAS.

.1 MAKEFILE.BAS

This program is used to create, modify and list EDIT.DAT.

.2 EDIT.DAT

This data file is the "template" created by MAKEFILE.BAS to edit the answers to the data form for type, field length and range. Six criteria for each answer are specified. These are as follows.

(a) LENGTH - Data item field length (ie. the number of boxes on the form).

(b) MIN - The minimum value for data of type "N" or "I" as defined below.

(c) MAX - The maximum value for data of type "N" or "I" as defined below.

(d) STEP - The incremental value for data which has a MIN and MAX specified. Most frequently this is 1 but note that it is 5 for datum #23.

4.4.1 Editing Software Description (Cont'd)

.2 EDIT.DAT (Cont'd)

(e) CODE - This is the value for LCODE% within the data entry programs. It is a number between 1 - 4 defined as:

- 1 = Answer must fill all the boxes on the form completely
- 2 = Answer must not be longer than the number of boxes but may be shorter. A null response is accepted.
- 3 = Same as 2 except a null response is NOT accepted.
- 4 = Same as 1 and a null response is accepted.

(f) TYPE - This is a single character defining the type of datum as defined below:

- I = Integer Data of this type must be solidly numeric. During processing integer data is converted to a numeric quantity by the VAL function.
- N = Numeric. This is a usually coded value. It must be solidly numeric.
- D = Date. Date type data is solidly numeric in YYMMDD format.
- L = Logical. A no (Ø)/yes(1) response.
- C = Character. Any member of the full character set is allowed. Name or address data is character type.

With the modify feature of the MAKEFILE.BAS program EDIT. DAT has been configured to the ENERSAVE form.

4.4.1 Editing Software Description (Cont'd)

.3 DATAEDIT.BAS

This program edits a set of audit files on drive B. The files are stored on a set of disks labelled 001 through 006. For the Newfoundland version the disk set corresponded to the dates and places when and where the audits took place. The disk code is:

1. DK001 - St. John's Houses November 15-19, 1982
2. DK002 - St. John's Houses Sept. to Nov. 12, 1982.
3. DK003 - St. John's Houses Nov. 22 - 26, 1982
4. DK004 - St. John's Houses Nov. 29 - Dec. 3, 1982
5. DK005 - St. John's Houses Dec. 7 - Dec. 9, 1982
6. DK006 - Labrador Houses & Gander Houses

The Gander files are suffixed by 444 and Labrador files are suffixed by 000. Listings of all the data base management programs and included in Appendix X.

4.4.2 Editing Procedure

When a disk containing a set of files is edited the following procedure is initiated. The DATAEDIT.BAS is in Drive A and the files to edit on a separate disk is placed in Drive B. Drive B contains two sets of files, the individual audit files and a file containing the audit file's names called DK001.NAM to DK006.NAM. When DATAEDIT.BAS is run the program asks for the Disk number. The program then proceeds to read the "NAM" file

4.4.2 Editing Procedure (Cont'd)

and edits all the audit files contained therein. The editing program identifies all errors and CRUNCH.BAS is used to correct the file.

4.4.3 Procedure Problems

The data base management software was sent to Newfoundland as a hardcopy because of the difference between the KayPro and Osbourne microcomputer systems which did not allow the direct transfer of programs on floppy diskettes. As a result there were several difficulties encountered before the actual data correction began. These were:

- minor problems in the hardcopy sent to Newfoundland, and
- code definition errors in EDIT.DAT which did not allow for a total elimination of all "error" codes generated by DATAEDIT.BAS.

The first difficulty was quickly resolved internally. The second problem still exists and is included in the disk files. However these are not numerical errors and do not affect the quantitative results in the data base.

4.5 RECOMMENDATIONS - MAIN PILOT

The following recommendations are based on experience gained from the main pilot and are presented for consideration in the planning stage of future programs.

4.5 RECOMMENDATIONS - MAIN PILOT (Cont'd)

1. The training program should be extended to give the advisors more time to study technical related material. Consideration should be given to extending the course to a three month duration followed by a written technical exam which must be passed to become an energy advisor. It was felt that the advisors selected for the main pilot were basically good communicators however on a few occasions their lack of knowledge on some technical aspects reduced self-confidence and probably resulted in a reduction of homeowner confidence.

2. The number of sample surveys should be increased during the last part of the training course. It is felt that the advisor should lead a minimum of ten (10) surveys under close supervision of "trained" personnel. In so doing, the advisor will have a better chance to develop proper audit delivery techniques, thus minimizing potential problems in the field such as data formatting and equipment use.

3. The Department of Energy, Mines and Resources in liason with the consultant should initiate a public relations compaign. This would act to not only increase the awareness of the public to the program but would also increase the credibility of the program. There were occasions when the homeowner questioned the authenticity and credentials of the project and its members. Increased publicity would act to increase response rate and homeowner co-operation.

4.5 RECOMMENDATIONS - MAIN PILOT (Cont'd)

4. The dispatcher, who is normally the first person to speak to the homeowner, should be thoroughly familiar with the program. In this way homeowners who have a marginal interest in the program, could be given positive reinforcement to procede with the survey.

5. In the letter, the importance of returning the application before the deadline date should be stressed. In the particular program at hand, even though between two and three weeks was given for return of the application, the team was forced, because of the low early response rate, to accept applications up to a month after the deadline. In fact in one case a homeowner returned the application three months late.

6. Consider the possibility of implementing evening and/or weekend appointments for homeowners who are unavailable during regular working hours. In the case of evening surveys, hours of available daylight may be a limiting factor.

7. The problem of cancellations must be minimized in future projects. In the case of the Newfoundland Pilot Study, the project was fortunate in being able to draw up a list of homeowners who could have their home surveyed on short notice. This system would be impractical for a national program and would at best be an administrative nightmare. It is felt that if the survey program were made

4.5 RECOMMENDATIONS - MAIN PILOT (Cont'd)

mandatory for COSP and CHIP eligibility the problem would be minimized. If a non-mandatory program is adopted some sort of bonus system such as tax credit may encourage homeowners to keep appointments. If a decision is made to have homeowners contribute to the cost of the survey, a down-payment required with the appointment request may also minimize cancellation.

8. If a national program is implemented, trained inspectors should be hired by Energy, Mines and Resources to monitor and evaluate energy advisors in the field. In so doing, homeowners would be assured of receiving a high quality service.

9. All future energy advisors should be C.G.S.B. certified. There have been reports during the pilot study that homeowners had already been solicited by individuals and companies offering home surveys. Such individuals, if not properly trained, could seriously jeopardize the validity of the whole program. Homeowners should be encouraged to have surveys carried out by only C.G.S.B. certified advisors.

10. A continuing education program should be implemented to keep advisors informed of the latest developments in technology and residential construction.

4.5 RECOMMENDATIONS - MAIN PILOT (Cont'd)

11. Key individuals should be made available to the advisor to answer questions on all aspects of the survey. In the Newfoundland Pilot Study, this was accomplished during the Friday morning survey de-briefings. It is unlikely that a regular Friday morning debriefing will be required for "experienced" advisors, but a supervisor to address questions and give answers on procedure problems will be necessary.

12. A review agency should be established with a mandate to review and update all aspects of the procedure as required. This review should be based on experience gained through the pilot projects and a possible national program.

Test Site	Number of Applications Mailed	Number of Applications Received	Percentage of Applications Received
St. John's - # 28	200	47	24%
St. John's - # 52	200	36	18%
St. John's - # 62	275	21	8%
St. John's - # 69	225	33	15%
Petty Harbour	203	14	7%
Gander	300	44	15%
Happy Valley-Goose Bay	150	20	13%
	1,553	215	14%

TABLE 4.1

SUMMARY OF RESPONSES TO THE HOMEOWNER MAIL SOLICITATION

Typical Newfoundland Housing Stock Characteristics	Housing Stock** Analysis (%)	Main Pilot Houses (%)
Single Detached	81	87
Single Attached	7	13
Electrically Heated	34	17
Forced Hot Air (Oil Heat)	27	32
Hot Water/Steam (Oil Heat)	14	46
Other *	25	5
Age Band 1959+	55	55
Age Band 1940 - 1959	26	27
Age Band Pre 1940	19	17

* "Other" refers to wood fuel systems, oil space heaters or combination space heating systems.

** Statistics Canada Data.

TABLE 4.2

COMPARISON OF TYPICAL NEWFOUNDLAND HOUSING STOCK WITH HOUSES SURVEYED DURING THE MAIN PILOT

Test Site	Number of Applications Received	Number and (Percent)* of Houses Surveyed		Percentage of Total Number of Houses Surveyed
St. John's - Area 28	47	29	(62)	22%
St. John's - Area 52	36	21	(58)	16%
St. John's - Area 62	21	10	(48)	8%
St. John's - Area 69	33	18	(55)	14%
Petty Harbour	14	3	(21)	2%
Gander	44	20	(45)	15%
Happy Valley-Goose Bay	20	9	(45)	7%
Other **	N/A	23	(N/A)	16%
TOTAL	215	133		100%

* Percentage based on number of applications received per site

**Refers to training and substitute houses, located in the St. John's area

TABLE 4.3

COMPARISON OF APPLICATIONS SOLICITATED AND HOUSES SURVEYED

STATEMENT	POOR %	FAIR %	AVERAGE %	GOOD %	EXCELLENT %
Helpful and courteous n=64	--	--	1.6	28.1	70.3
Well informed on topics you thought important? n=64	--	1.6	9.4	48.4	40.6
Easy to understand n=64	--	--	6.2	40.6	53.1
Careful in his/her work n=64	--	1.6	3.1	35.9	59.4

TABLE 4.4

HOMEOWNER'S RATING OF ENERGY ADVISORS'S WORK

FIGURE 4.1

MAIN PILOT FIELD TEST SITES

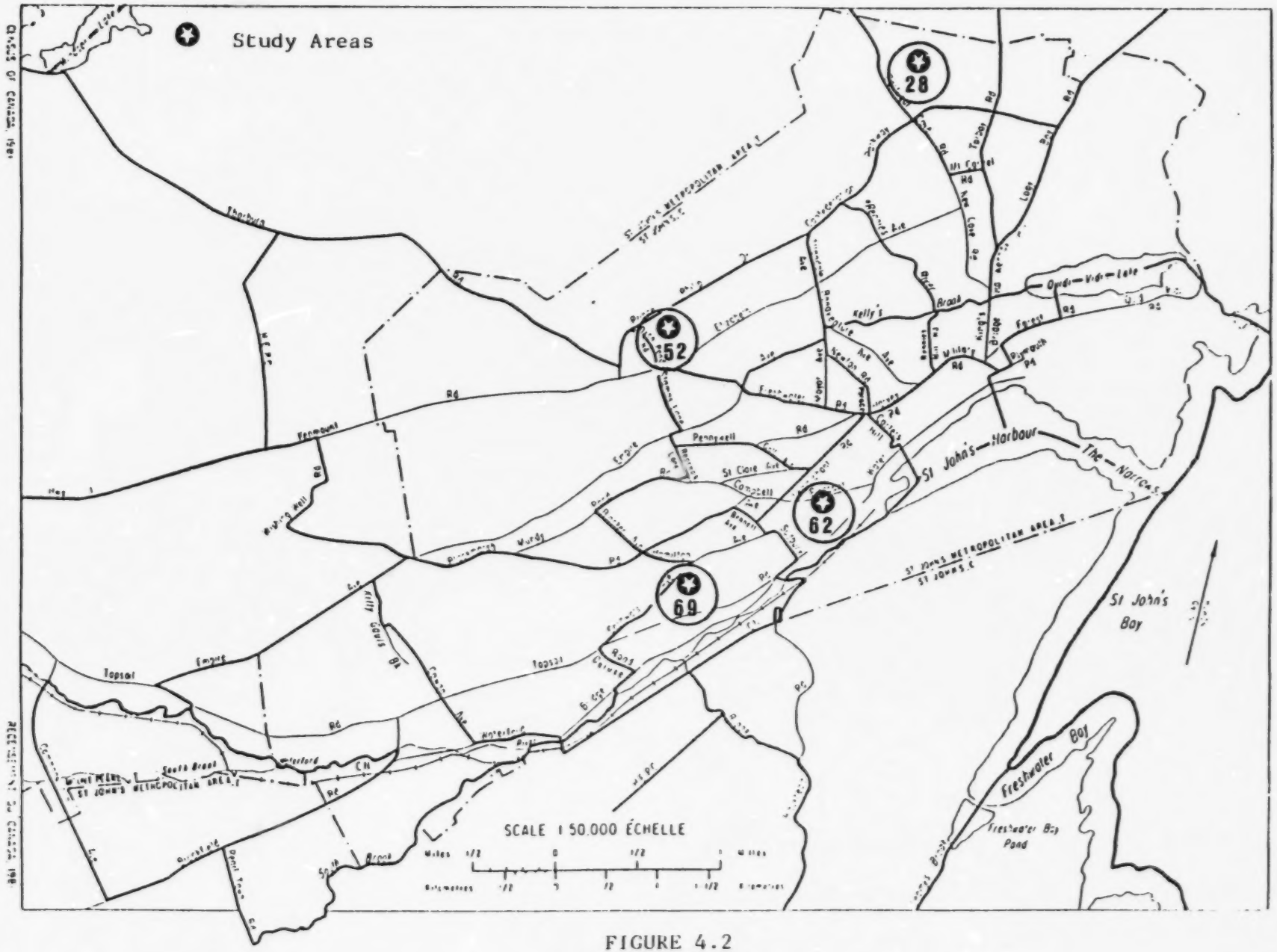
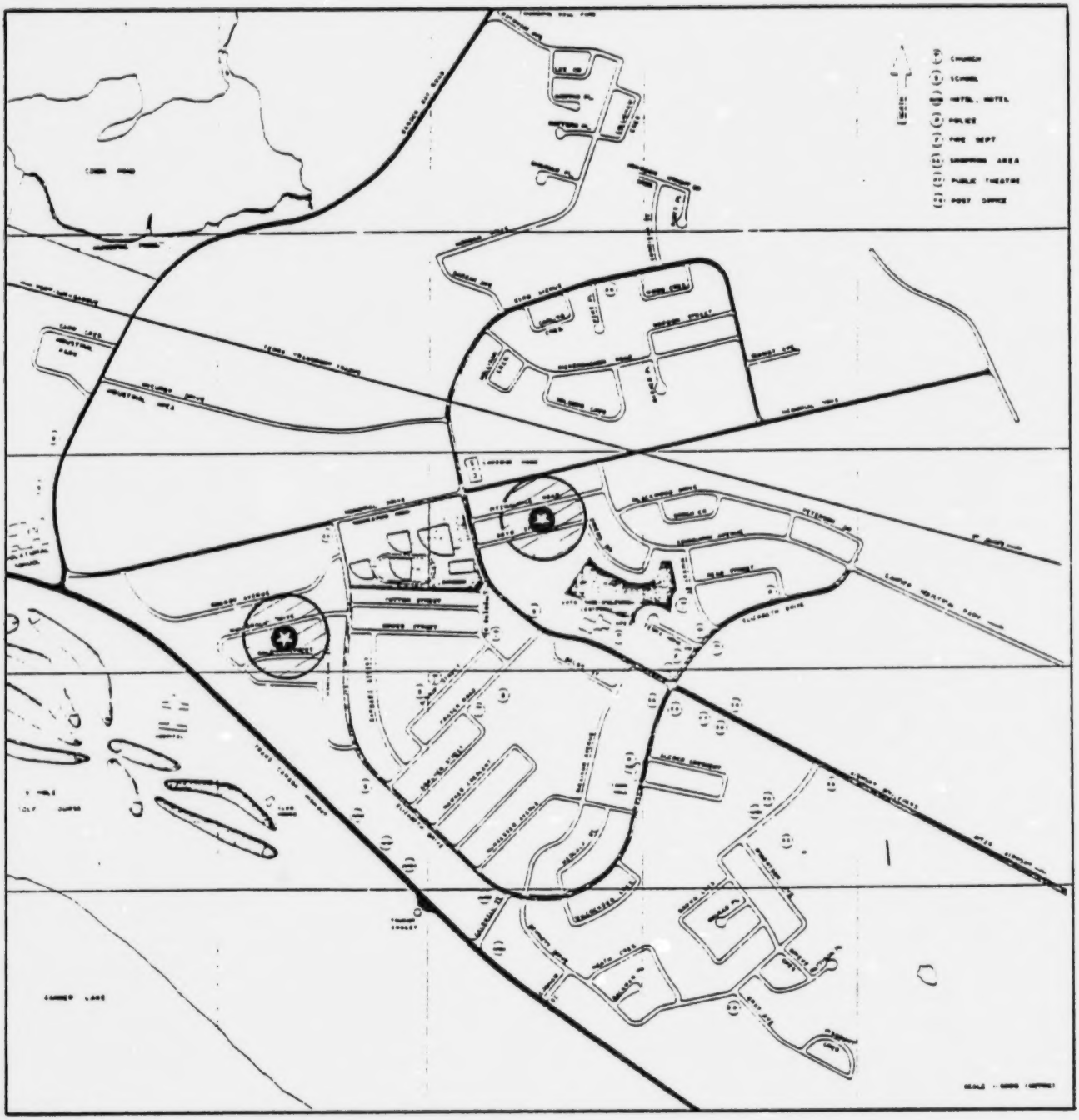


FIGURE 4.2

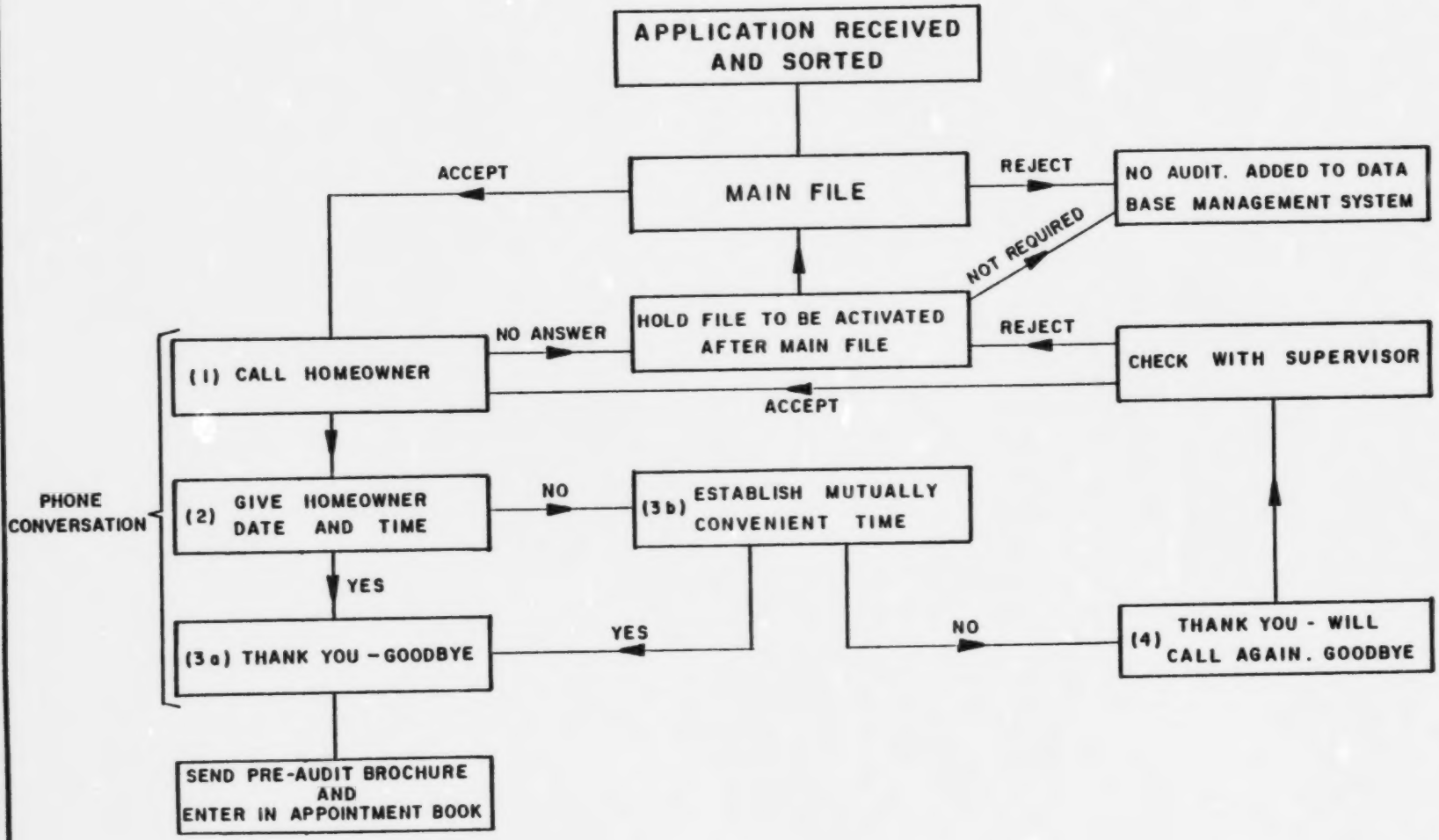
ST. JOHN'S SURVEY SITES



Study Area

FIGURE 4.3

GANDER SURVEY SITES



TELEPHONE DISPATCHERS FLOW CHART

FIGURE 4.4

Hello, my name is _____ and I work for ShawMont Newfoundland Limited.

1. I am calling in reference to your request for a Home Energy Survey. I would like to arrange a convenient time for an appointment.

2. Would you be available on

_____	_____	_____	_____
Day	Date	Month	Time

3. (a) If YES.

   Thank you, you should allow approximately three hours for the survey and if possible could you please have your fuel bills and electricity bills available for the advisors.

   Do you have any access to the basement and attic. Do you have a ladder available (if required).

   You will be receiving a brochure within the next few days indicating what to expect from the appointment. Please call 754-0250 and ask for Mike Warren if you encounter any problems.

3. (b) If NO.

   What would be the most convenient time for an appointment? (Try to steer the homeowner into a time convenient for the auditors. Avoid evenings until further notice).

   If acceptable go to 3a.

   If not acceptable go to 4.

4. I will make a note of your most convenient time and discuss it with my supervisor. I will be in touch with you again shortly.

   Thank you for your time.

   BYE

FIGURE 4.5

TELEPHONE DISPATCHER SCRIPT

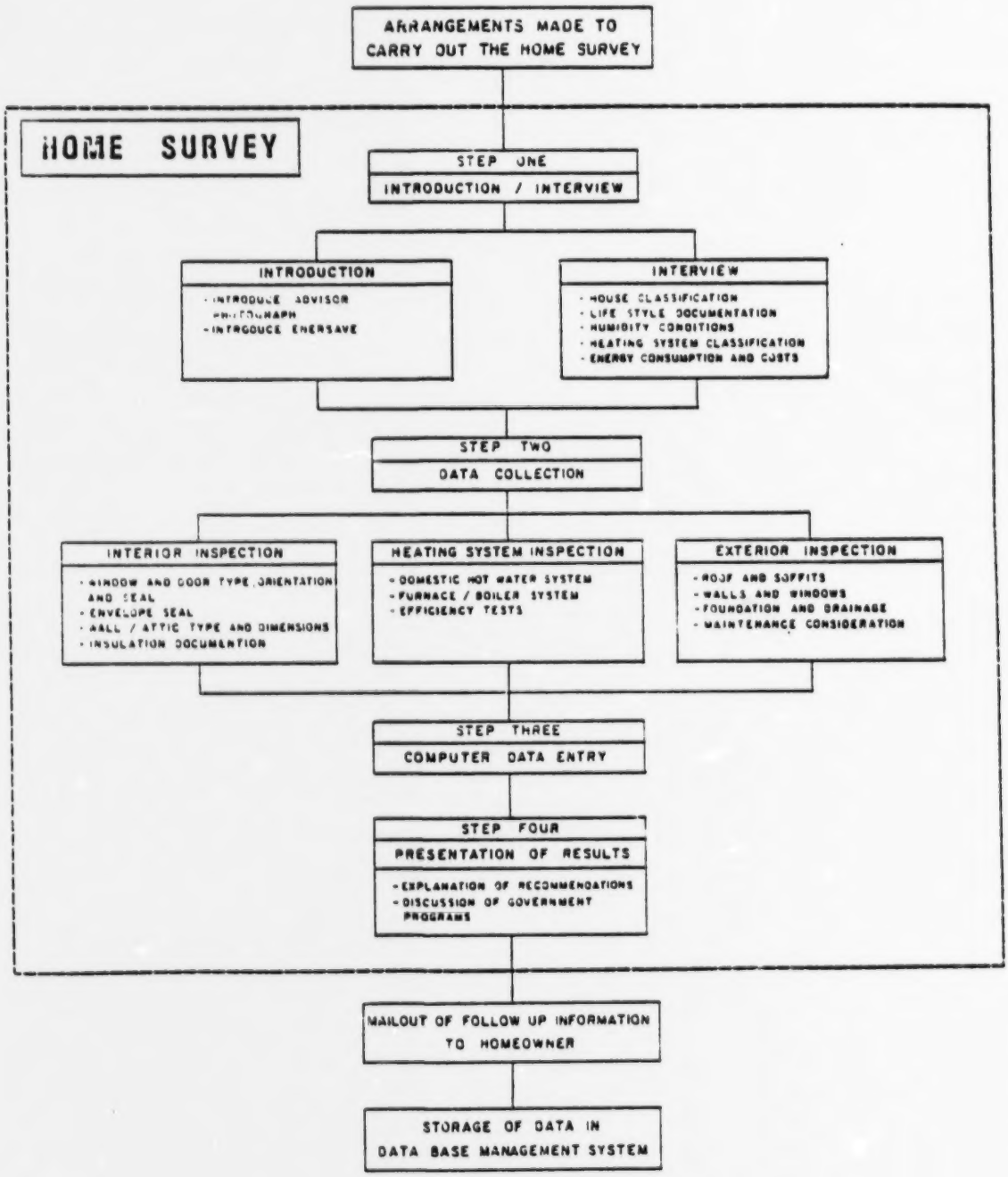


FIGURE 4 6

ENERSAVE ADVISOR'S PROCEDURE

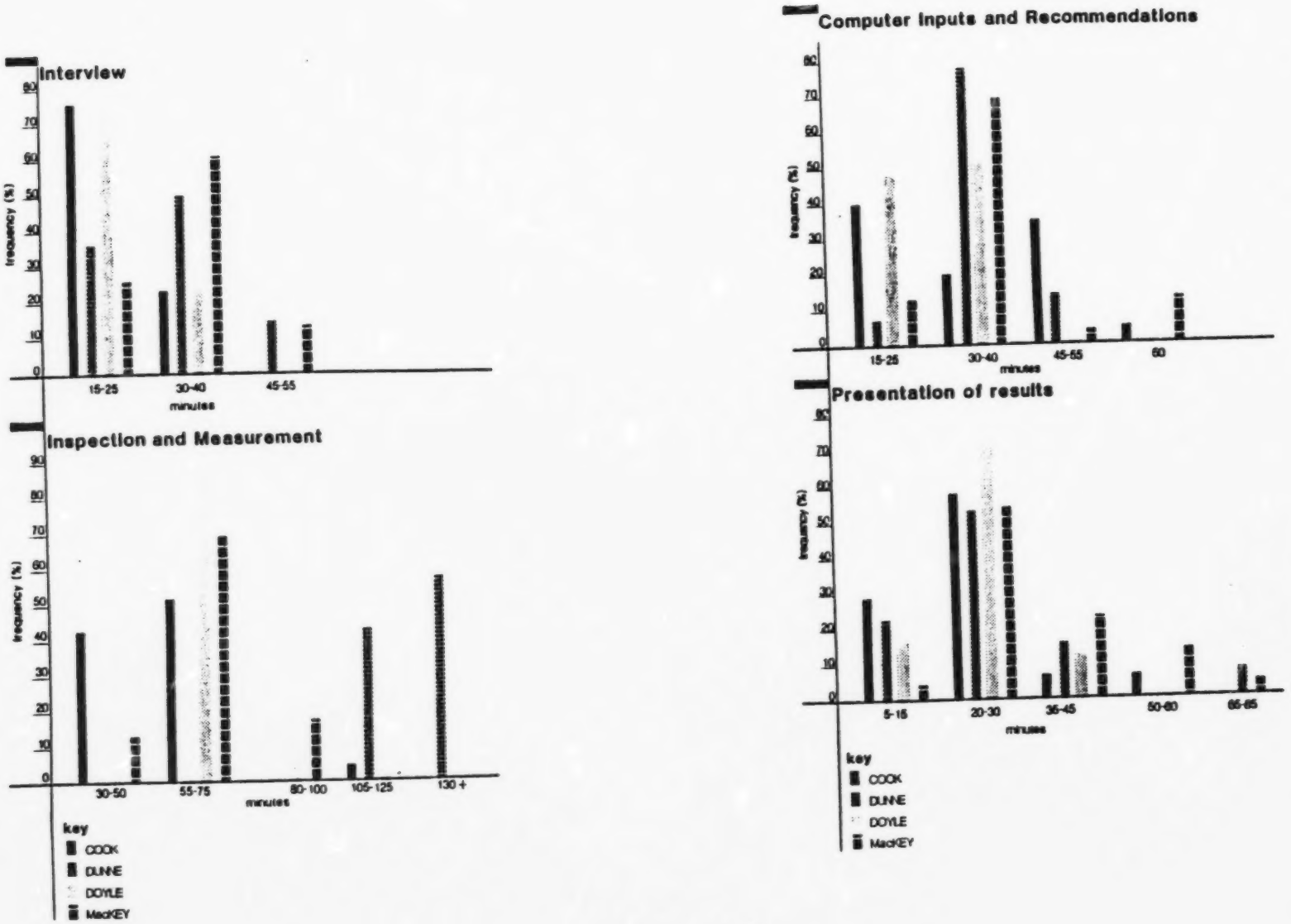


FIGURE 4.7

TIME RANGE PER ADVISOR

PART FIVE

MANAGEMENT PLAN

PART FIVE - MANAGEMENT PLAN

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5.1 INTRODUCTION

Based on the experiences gained through the Newfoundland Pilot Project, there is perceived to be a definite requirement for a full scale Residential Energy Audit Program for the Province of Newfoundland. The Organization and Implementation of such a project is in itself a mamoth undertaking requiring careful consideration of a number of complex variables during the initial planning stages of the program. The following section outlines some of the important factors and considerations to be addressed in a Management Plan for the project. A program scenario is presented which estimates the number of advisors required, outlines important supply/demand considerations and estimates the demand for surveys. A proposed management and organization plan is presented which outlines the job descriptions of key individuals as well as a typical planning schedule for the implementation of surveys. A cost estimate for the project has also been presented.

5.2 DEVELOPMENT OF PROGRAM SCENARIO

The following section outlines the important variables and factors which should be considered during the planning stage of a full scale home energy advisory service. Important factors such as the number of advisors required, the demand for surveys, and the cost per survey are discussed. Administrative considerations such as the delivery agent, eligibility, mandatory versus nonmandatory programs, and homeowner contributions are also presented.

5.2.1 Advisor Man-Year Concept

The advisor manyear concept has been used to assist in developing a long term strategy for the implementation of a full scale audit program for the Province of Newfoundland and Labrador. The concept is based on the total number of audits that an advisor can perform in a year while maintaining a high standard of workmanship. Based on the experience gained through the Newfoundland Pilot Study, an average audit will require approximately three (3) hours to complete. Approximately one half (1/2) hour per audit on the average should be allowed for transportation to and from the home. An additional allowance for transportation time may be required when the advisor is working in a rural community. On the basis of the above time durations it is felt that the advisor will complete a maximum of two (2) audits per day. The advisor manyear concept assumes that the advisor will be hired on a full time basis with a two (2) week vacation period and approximately ten (10) holidays a year. With an allowance for sickness and temporary leave, it is estimated that there will be a total of two hundred and thirty (230) working days available to the advisor during which a total maximum of four hundred and sixty (460) audits a year can be carried out.

This concept assumes that an experienced advisor will not require a weekly de-briefing as was implemented in the pilot study. Procedural or equipment problems are expected to be dealt with on an individual basis with the Technical Manager and should not interfere with the advisors schedule. The responsibility of filing data and mailing homeowner information kits will be that of the secretary/dispatcher thus leaving the advisor free to carry out audits five days a week.

5.2.2 Supply/Demand Considerations

Probably the most important single factor to be considered in the planning stage for implementation of a full scale audit program is the estimate of the demand. At present there are a number of considerations which will determine the demand for a residential energy advisory service and the ability of a delivery agent to supply the service. On the supply side, the program is limited to the number of advisors which can be trained per year. Logistical problems, administrative considerations, and overall program costs will limit the supply of advisors required to deliver the survey. With respect to demand, there are four important factors to be considered:

- present and future eligibility clauses of both CHIP and COSP
- mandatory or non-mandatory audits to qualify for CHIP and COSP
- promotion of the program
- cost of the audit to the homeowner

According to the latest statistics from the local CREO office, supported by the social survey (Section 3.4), approximately fifty-five (55) percent of the total eligible housing stock have applied for CHIP while less than ten (10) percent have applied for COSP. Between the months of April 1982 and March 1983 approximately twenty thousand (20,000) CHIP grants and ten thousand (10,000) COSP grants were issued in the Province of Newfoundland and Labrador. This trend is not expected to continue, however, due to the recent eligibility changes in the

5.2.2 Supply/Demand Considerations (Cont'd)

CHIP program and the fact that a high percentage of the population have already received CHIP grants. The main emphasis over the next four years is expected to be on the COSP program. It is interesting to note that approximately 92% of the social survey respondents have not taken advantage of COSP. There is also a possibility that both the present CHIP and COSP programs may be restructured into a "super" program for which the total existing housing stock may be eligible.

A decision has not yet been made as to whether a residential energy audit will be a mandatory or non-mandatory requirement for eligibility under the CHIP and COSP programs. If a mandatory program was implemented, it would create a constant high demand for the services of a qualified energy advisor. During the initial implementation of a mandatory program there would be a period of at least one year during which there would be a shortage of advisors to carry out the work.

Based on 1983 take-up rates for CHIP and COSP, thirty thousand (30,000) grants would have created a demand for approximately sixty-five (65) manyears of work based on the advisor manyear concept. With the current availability of skilled labour to train energy advisors, it is felt that only twenty five percent of this demand could be met in the first year. This would result in long waiting lists of frustrated homeowners requesting surveys. Based on the results of the main pilot, it appears that a non-mandatory program would result in a lower demand for the services of an energy advisor. An average of fifteen (15) percent of the homeowners

5.2.2 Supply/Demand Considerations (Cont'd)

solicited during the main pilot returned application forms requesting a survey. The return rates ranged between a high of approximately twenty-eight (28) percent to a low of seven (7) percent. Fifteen (15) percent of the total estimated Newfoundland and Labrador housing stock would represent approximately 50 manyears of work over the full program. This demand could be met provided the program was carried out over two or more years.

An important factor to consider in controlling the demand is the use of area-specific promotional techniques. A non-mandatory program would require selective advertising through the various types of media to stimulate interest and create a demand in pre-selected areas of the province.

No decision has yet been made as to how the audit program would be funded. There have been suggestions made that the full cost of the audit be covered under the existing funds available through both CHIP and COSP. Other suggestions have been made towards implementing a cost sharing arrangement in which a portion of the survey would be paid by the homeowner and the remainder would be paid for from either the CHIP or COSP grants. Funding any portion of the audit under the CHIP or COSP grants would reduce the amount of money made available to the homeowner to carry out energy retrofit. It is uncertain at this time what the overall effect of the

5.2.2 Supply/Demand Considerations (Cont'd)

audit on the program might be. It is felt that the energy retrofit to the homeowner will offset the potential negative effects of reduced funding and provide more potential for achieving the main objectives of the residential energy advisory program. With respect to the idea of cost sharing, careful consideration should be given to the homeowner contribution. In todays hard economic times, this contribution may require a significant portion of the homeowners disposable income resulting in a reduced demand for the service.

5.2.3 Number of Advisors Required

The number of advisors required for the implementation of a full scale audit program will be determined by three (3) important factors:

- the number of advisors which can be trained per year;
- the total estimated demand for surveys;
- the duration of the program

Of the above three (3), the number of advisors which can be trained per year is considered to be the limiting factor for planning purposes. At present there are a limited number of trained classroom and field instructors conversant with the main objectives of a home energy advisory service, who could be used to implement a training program. Based on the present availability of qualified instructors, considerations respecting optimum instructor/student ratios and a course length of approximately three months duration it is felt that a maximum of 30 students a year (10 per class) could be trained.

5.2.3 Number of Advisors Required (Cont'd)

The demand for surveys will ultimately determine the number of advisors required and consequently the number of training courses to be implemented. The duration of the program however will also play an important role in determining the number of advisors required. Two extreme cases can be considered with respect to the duration of the program. The first would be a very short program in which a large number of advisors would have to be selected and trained to meet the expected demand. One advantage of this scenario is that the risk of long lists of homeowners waiting to have a survey performed would be minimized. An important disadvantage however would be that at the end of the relatively short program, there would probably be too many advisors to integrate into the existing work force, therefore, many of the skilled advisors would be left either unemployed or working in jobs requiring different skills or training.

The second extreme concerns running a program over an extended period of time, (five years or more). In this scenario it is conceivable that homeowners may be required to wait long periods of time (greater than 1 year) to have a survey carried out. During this waiting period it is probable that a high percentage of homeowners would lose interest in having the survey completed. With an extended program, a one year training program would probably produce all the advisors required to meet the demand. Over the length of the program, however, it is uncertain how many of the original advisors would drop out of the program. If this drop out rate is high, the expense of a second training program may have to be incurred to meet the demand for surveys. One advantage of the extended program would be that most, if not all, of the advisors trained would be able to find work in the field upon completion of the program.

5.2.3 Number of Advisors Required (Cont'd)

The real challenge at the planning stage is to develop a program which maximizes the advantages and minimizes the disadvantages associated with the three main factors mentioned above. To assist in meeting this challenge, Table 5.1 has been provided. In this table, the interdependency of each of the three main major factors is clearly evident. The proposed home energy advisory service, if implemented, will fall under the National Energy Program whose mandate will run to 1990. It is felt that the earliest possible time surveys could commence would be during the first quarter of 1984. Commencing with this date, the top of Table 5.1 outlines the maximum number of years during which the program could be implemented. With respect to estimates of demand, the total possible housing stock for Newfoundland was determined from Statistics Canada and converted into total possible manyears of work using the advisor manyear concept. The side of the table outlines the incremental estimates of demand, based on a percentage of the total possible housing stock. The main body of Table 5.1 outlines the estimated manyears of work required based on estimates of demand for surveys and the duration of the program. It is interesting to note that a maximum of 30 advisors a year could be trained for the program. If it is assumed that a training course will be implemented for one year only, Table 5.1 can be used to estimate the duration of a field program to meet any anticipated demand for surveys.

5.2.4 Estimates of Demand for Surveys

As previously mentioned in Section 5.2.2, there are a number of important factors which must be considered when predicting the demand for surveys. The overall cost of the survey, the use of effective advertising, and eligibility cluases of both CHIP and COSP will ultimately determine the demand for the services for qualified residential home energy advisors. To assist in developing a management plan for the proposed home energy advisory service, a decision was made to look at the total existing housing stock of the province and determine the concentrations of homes in small geographical areas. This decision was based on the results of the social survey which indicated that 92% of the respondents had not applied for COSP. It should also be noted that of the 8% of the respondents who have applied for COSP and the 54% who have taken advantage of CHIP, there is still a possibility that more funds are available depending on how much of the first grant was used.

Statistics Canada was used to determine the total number of houses per census division as shown in Table 5.2. From this information, the Province of Newfoundland and Labrador was divided into four (4) major regions. As shown in Figure 5.2, there are major centres which could be used for regional office locations in each of the regions. As an example, St. John's, Corner Brook, Gander and Happy Valley/Goose Bay could serve as regional offices for Regions 1, 2, 3 and 4 respectively. In Region 4, it is possible that the work would be done on a seasonal basis to minimize administrative and logistical problems associated with Labradors harsh winter conditions.

5.2.4 Estimates of Demand for Surveys (Cont'd

During an actual program, it may be advantageous to re-group divisions within each region, however, for the purposes of this management plan, the regions outlined in Table 5.2 have been proposed. It is anticipated that the restructuring of regions may be benefical from an administrative point of view, however the overall cost of the program is not expected to reduce significantly. Estimates of the percentage of the total Newfoundland Housing Stock have been given on both a regional and division basis as well as the equivalent manhours of work based on the advisors manyear concept.

5.3 MANAGEMENT AND ORGANIZATION

No decision has been made with respect to how a proposed Newfoundland and Labrador Home Energy Advisory Program would be administered and implemented. With respect to implementation, a choice of Delivery Agents are available:

1. Use of Energy Mines and Resources staff and offices for the entire range of activities;

2. Use of private firms either under contract to Energy Mines and Resources or on the basis of competing for audit clients with payment on a per-audit basis by EMR;

3. Some combination of the above options;

4. The use of a provincial utility.

5.3 MANAGEMENT AND ORGANIZATION (Cont'd)

As indicated above, the choice of delivery agent affects the extent of administration required. Designers of the proposed program must consider the general organization of the program in terms of the number and location of administrative offices as well as the associated administrative staff. Such staff could include those necessary to report to Energy Mines and Resources Canada, those responsibile for hiring and training advisors, and staff for soliciting audits, scheduling audits and doing whatever follow-up work is necessary.

Clearly there are advantages and disadvantages associated with each of the above options for choice of a Delivery Agent. Based on the experience gained through the Newfoundland Pilot Study, Option 2 and 3 would appear to be the logical choices to be considered in the planning stage of a full scale project. At present, the majority of personnel with the necessary skills to select, train and co-ordinate energy advisors are found in the private sector. This is largely due to experiences gained through the recently completed Newfoundland and Labrador pilot project, sponsored by Energy Mines and Resources. If either option 1 or 3 were selected, it is felt that there would be numerous political and administrative problems encountered which would seriously affect the overall timing for both the commencement and completion of the program. The following section outlines a proposed management plan for the implementation of a full scale audit program based on Option 2.

5.3.1 Proposed Organization

The services of an experienced project management consulting firm would be required to plan, organize and implement a full scale Newfoundland and Labrador Home Energy Advisory Program. The firm would at a minimum require the key individuals outlined in the proposed Organization Chart, Figure 5.2. The following is a brief description of the positions referenced in Figure 5.2:

.1 Energy Mines and Resources

Energy Mines and Resources would be the government department responsible for the overall funding and implementation of the program. At a minimum, there would be a requirement for an overall Program Manager, a cost control manager, public relations manager and a quality control manager. EMR would be responsible for establishing the yearly budget for the program as well as the necessary administrative duties required by government. It is anticipated that EMR will provide the necessary promotional backing to establish program credibility with the general public. There will also be a requirement for un-bias quality control monitoring of the advisors performance in the field.

.2 General Manager

The general manager will provide the necessary liaison with EMR. He will be responsible for the overall project management of the program and will have four key individuals reporting directly to him; a Public Relations Consultant, Training Co-ordinator, Secretary/Data Base Co-ordinator and Field Technical Co-ordinator. The General Manager will primarily be responsible for cost control and

5.3.1 Proposed Organization (Cont'd)

.2 General Manager (Cont'd)

budgeting, as well as the other administrative duties within the project.

.3 Public Relations Consultant

It is anticipated that a sub-contract will be arranged with a local public relations firm to plan organize and implement promotional campaigns as required on a regional basis. The services of a good public relations consultant will be essential in maintaining the necessary demand for the advisors services.

.4 Training Co-Ordinator

The Training Co-ordinator will be responsible for the overall planning, organization and implementation of the energy advisor training course. He will provide the necessary day to day liaison with the educational facility and have direct input into the development of the course curriculum. He will also be directly responsible for ensuring that the advisors are trained to meet the standards required for the work.

.5 Secretary/Data Base Co-ordinator

This individual will provide two main functions. As a secretary, the person will be responsible for administrative and general office work as required by the General Manager. As Data Base Co-ordinator,

5.3.1 Proposed Organization (Cont'd)

.5 Secretary/Data Base Co-Ordinator (Cont'd)

the individual will be responsible for transferring field data into a format which is acceptable to EMR. The person will also assist Region 1 Secretary/Dispatcher as required.

.6 Field/Technical Co-ordinator

This individual will provide two main services to the program. As a field co-ordinator, the responsibility includes planning and setting up of regional offices as well as monitoring the day to day operation of each office. The four Regional Co-ordinators would report directly to the Field/Technical Co-ordinator and provide him with costing and scheduling information. The individual will also be responsible for establishing the yearly budget for each office and providing manpower forecasts. It is anticipated that he would visit each regional office at least once a quarter to monitor the regional operations first hand. As a technical co-ordinator, the individual would be responsible for addressing all equipment and procedural related problems which may occur in the field.

.7 Regional Co-Ordinator

The Regional Co-ordinator will be responsible for the day to day operation of the regional office. He would ensure that all energy advisors are kept productive and would be responsible for producing the monthly manpower estimates required by the

5.3.1 Proposed Organization (Cont'd)

.7 Regional Co-ordinator (Cont'd)

Field/Technical Co-ordinator. He will also supervise the work of the Secretary/Dispatcher and provide assistance to the Field/Technical Co-ordinator on budgetary and administrative work. The Regional Co-ordinator will be expected to carry out energy surveys to assist in meeting regional quotas. He will also provide limited technical assistance as required by the regional field staff.

.8 Regional Secretary/Dispatcher

The Secretary/Dispatcher will be responsible for two main functions. As a secretary, the individual will carry out the required administrative and typical office work required by the regional co-ordinator. As a dispatcher, the individual will contact homeowners requesting surveys and set up appointments to have the work carried out. Typically the dispatcher would be responsible for making the necessary appointments to keep each advisor busy, on a weekly basis. The individual would also be responsible for collecting the necessary field data from the energy advisors and forwarding it to the Secretary/Data Base Co-ordinator.

.9 Energy Advisors

The Energy Advisor would carry out the actual field surveys. They would be responsible for checking with the regional dispatcher on a regular basis to obtain these appointments. As well as making confirmation telephone calls to homeowners at least

5.3.1 Proposed Organization (Cont'd)

.9 Energy Advisors (Cont'd)

24 hours in advance of a scheduled survey. The advisors would be required to carry out the survey in accordance with the procedures developed in the training course. They will also complete all data forms and reports as are necessary to monitor the performance and progress of the program.

5.3.2 Typical Planning Schedule

To assist in producing a cost estimate for a Newfoundland Audit Program, a typical planning schedule was produced (refer Table 5.3). A demand for surveys of approximately 30% of the total housing stock has been used as a basis for the schedule. Based on the data obtained from the pilot study, this demand estimate may be optimistic assuming a non-mandatory program is implemented. It is felt, however, that the per unit cost per audit derived from this schedule represents a realistic cost which will be independent of actual demand for surveys.

As shown in Table 5.3, the Province has been broken up into four regions based on the data presented in Table 5.2. It has been assumed that the program will commence in the first quarter of 1984 and will run continuously through to the third quarter of 1987, (approximately 3 1/2 years duration). The time frame to complete the surveys is based on data presented in Table 5.1. As shown in Table 5.3, the training of the advisors will occur in Region 1 for the first three quarters of 1984.

5.3.2 Typical Planning Schedule (Cont'd)

A total of thrity advisors per course will be trained; ten advisors for each three month course. Following training, each class of students would be put immediately to work in Region 1 under close supervision of the Field/Technical Co-ordinator. During this supervision period, the Field/Technical Co-ordinator would be identifying key individuals to fill the four Regional Co-ordinator positions. By the end of the third quarter it is anticipated that four of the energy advisors will have been selected and trained to act as Regional Co-ordinators. During the 3rd quarter of 1984, the Field Co-ordinator would be responsible for making arrangements to have the four regional offices set up as required in the schedule.

It is anticipated that survey work would commence in the remaining regions during the last quarter of 1984. As shown in Table 5.3, it is anticipated that approximately twelve advisors will be required for Region 1, ten advisors for Region 2, eight advisors for Region 3 and two advisors for Region 4. Survey work in Region 4 will probably proceed on a seasonal basis to minimize logistical problems which may result from Labradors harsh winters. To accomodate this seasonal requirement, advisors would be transferred from Region 3 to perform work in Labrador. Estimates of the total number of surveys per quarter and per year on a regional basis have been provided. It is estimated that a total of 7,360 surveys will be carried out in 1984, 15,000 in 1985, 15,000 in 1986 and 6,628 in 1987 for an estimated total of 43,988 surveys. This represents approximately 30% of the housing stock or an equivalent of 95.62 manyears of work based on the advisor manyear concept.

5.4 COST ESTIMATE

A cost estimate for a proposed Newfoundland Home Energy Advisory Program has been developed based on the planning schedule outlined in Section 5.3.2. Table 5.4 outlines all the assumptions which were used to produce the cost estimate. Table 5.5 provides a cost summary for the major components of the program. As shown in the table, the labour costs represent 59% of the total estimated cost. Of this percentage the advisors salary represents an estimated 39% of the cost while management and support staff represent approximately 20% of the cost of the program. Sub-contractors costs for promotional and training services are estimated to represent approximately 4% of the cost of the program. The indirect costs budgeted for the program represent approximately 37% of the total cost. Of this percentage the travel costs represent the highest protion at an estimated 20%. The high travel costs can be attributed to the geographical distribution of the housing stock population. The travel costs are anticipated to be especially significant in Regions 2, 3, and 4 where there is a high percentage of remote communities. As shown in Table 5.5, the total cost to survey approximately 30% of the total housing stock of the province is estimated to be $5,569,289 at approximately $126 per unit dwelling. Table 5.6 contains a breakdown of the unit cost for the proposed program. The unit cost of $126 per survey is felt to be a realistic cost for running a residential home energy advisory service in the Province of Newfoundland and Labrador. With the exception of certain office overheads and the sub-contractors costs for promotional and training services, the remainder of the component unit costs identified in Table 5.6 are considered to be virtually independent of the demand for surveys.

TABLE 5.1

ESTIMATE OF DEMAND FOR SURVEYS

% OF THE TOTAL POSSIBLE HOMES REQUESTING SURVEY	TIME FRAME TO COMPLETE ALL SURVEYS (YEARS)						
	1	2	3	4	5	6	7
	1984	1985	1986	1987	1988	1989	1990
10	32*	16	11	8	6	5	4
20	64	32	21	16	13	11	9
30	96	46	32	24	19	16	14
40	128	64	43	32	26	21	18
50	160	80	53	40	32	27	23
60	192	96	64	48	38	32	28
70	224	112	75	56	45	37	32
80	256	128	85	64	51	43	37
90	288	144	96	72	58	48	41
100	320	160	106	80	64	53	46

ASSUMPTIONS: (1) Total No. of Eligible Houses in Newfoundland = 150,000
(Based on Statistics Canada 1981)

(2) Total No. of Surveys Per Advisor Per Year = 460
(Based on Advisor Manyear Concept)

(3) Estimate of the Total No. of Manyears of Work = 320

* Manyears of work per year.

Proposed Region Number	Statistic Canada Division No.'s per Region	Geographical Area Covered	Total No. of Dwellings		Percentage of Nfld. Total		Equivalent* Man Years	
			Division	Region	Division	Region	Division	Region
Region 1	Division 1	Avalon Peninsula	65,110	65,110	44	44	141	141
Region 2	Division 2	Burin Peninsula	7,550	43,835	5	30	16	97
	Division 6	Central	11,295		8		26	
	Division 7	Gander	11,505		8		26	
	Division 8	North East Coast	13,485		9		29	
Region 3	Division 5	Corner Brook	12,330	31,615	8	21	26	68
	Division 3	South Coast	6,285		4		13	
	Division 4	South West Coast	6,996		5		16	
	Division 9	Northern Penin.	6,005		4		13	
Region 4	Division 10	Labrador	7,865	7,865	5	5	16	16
		TOTAL'S	148,425	148,425	100%	100%	322	322

*Based on the Advisor Manyear Concept

TABLE 5.2 - REGIONAL DEMAND ESTIMATE FOR SURVEYS

NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISOR PROGRAM

YEAR		1984				1985				1986				1987				
# OF WORKING DAYS/QUARTER		65	62	63	60	65	62	63	60	65	62	63	60	65	62	63	60	
QUARTER		1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	TOTALS
MONTH		1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	1 2 3	4 5 6	7 8 9	10 11 12	
COVERAGE:	REGION 1	--10*--	---10---	--10---														
Avalon Peninsula			---10**---	---20---	---12---	---12---	---12---	---12---	---12---	---12---	---12---	---12---	---12---	---12---	---12---			
	Total # of Surveys		1,240	2,520	1,440	1,560	1,488	1,524	1,440	1,560	1,488	1,524	1,440	1,560	1,488			20,248
	Equivalent Myrs.		2.7	5.4	3.1	3.4	3.2	3.3	3.1	3.4	3.2	3.3	3.1	3.4	3.2			44
	% of Demand Completed		6.4%	19.3%	26.6%	34%	42.4%	50.0%	57.6%	65.7%	74%	82%	88%	96.6%	100%			
ESTIMATED DEMAND: 42 Myrs																		
COVERAGE:	REGION 2				---10---	---10---	---10---	---10---	---10---	---10---	---10---	---10---	---10---	---10---	---10---			
Burin Penin.	Total # of Surveys				1,200	1,300	1,240	1,260	1,200	1,300	1,240	1,260	1,200	1,300	1,240			13,740
Central Gander	Equivalent Myrs.				2.6	2.8	2.7	2.7	2.6	2.8	2.7	2.7	2.6	2.8	2.7			29.8
Northeast Coast	% of Demand Completed				9.0%	18.6%	27.9%	37.2%	46.2%	55.9%	65.2%	74.5%	83.7%	93.3%	100%			
ESTIMATED DEMAND: 29 Myrs																		
COVERAGE:	REGION 3				---6---	---8---	---6---	---8---	---6---	---8---	---6---	---8---	---8---	---8---				
Corner Brook South Coast Southwest Coast Northern Penin.	Total # of Surveys				720	1,040	744	1,008	720	1,040	744	1,008	960	1,040				9,024
	Equivalent Myrs.				1.6	2.3	1.6	2.2	1.6	2.3	1.6	2.2	2.1	2.3				19.6
	% of Demand Completed				8.0%	19.5%	27%	38%	46%	58%	66%	77%	88%	100%				
ESTIMATED DEMAND: 20 Myrs																		
COVERAGE:	REGION 4				---2---	---0---	---2---	---0---	---2---	---0---	---2---								
Labrador	Total # of Surveys				240		248		240		248							976
	Equivalent Myrs.				0.52		.54		0.52		.54							2.10
	% of Demand Completed				26%		51%		79%		100%							
ESTIMATED DEMAND: 2 Myrs.																		
TOTAL PER QUARTER		-	1,240	2,520	3,600	3,900	3,720	3,780	3,600	3,900	3,720	3,780	3,600	3,900	2,728		-	43,988
EQUIVALENT MYR.		-	2.7	5.4	7.8	8.5	8.1	8.2	7.8	8.5	8.1	8.2	7.8	8.5	8.9		-	95.5
TOTAL PER YEAR		-	7,360			15,000				15,000				6,628				
EQUIVALENT MYR.		-	15.9			32.6				32.6				14.4				

NOTE: The above schedule is based on a demand of approximately 30% (95.5 Manyears) of the total Newfoundland and Labrador Housing Population)

* No. of advisors in training
** No. of advisors performing proposed Newfoundland and Labrador Home Energy Advisory Program Surveys

TABLE 5.3

TYPICAL PLANNING SCHEDULE

COSTING ASSUMPTIONS	Commitment	BASE YEAR COSTS 1984	1985	1986	1987
Personal Salaries:					
General Manager	50%	45,000	49,000	53,000	58,000
Field Technical Manager	100%	38,000	42,000	46,000	50,000
Secretary/Data Base Co-ordinator	100%	16,000	17,600	19,500	22,000
Training Co-ordinator	100%	38,000	--	--	--
Regional Co-ordinators	100%	20,000	22,000	24,000	26,000
Regional Secretary/Dispatcher	100%	16,000	17,600	19,500	22,000
Energy Advisors in Training	100	5.00/yr.	--	--	--
Trained Energy Advisors @ $8/Hr	100%	16,700	17,600	19,500	22,000
Indirect Costs:					
Office Space Rental:					
Region 1	3000 ft^2	$18/$ft^2$/yr	$20/$ft^2$/yr	$22/$ft^2$/yr	$24/$ft^2$/yr
Region 2, 3 and 4	2000 ft^2	$12/$ft^2$/yr	$14/$ft^2$/yr	$14/$ft^2$/yr	$16/$ft^2$/yr
Communications:					
50% of All Calls Long Distance		$3.00/Call	$3.30/Call	$3.50/Call	$3.80/Call
Meals and Accommodations:					
Assume Average of 50% of the advisors on the road at any one time		$65/day	$70/day	$75/day	$80/day

TABLE 5.4

LIST OF COSTING ASSUMPTIONS

PROPOSED NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISORY PROGRAM

	1984	1985	1986	1987	TOTAL
1. LABOUR COSTS:					
a - Management Staff	87,000	143,500	154,500	92,000	477,000
b - Support Staff	36,000	97,600	107,600	58,500	299,700
c - Energy Advisors	299,000	457,600	507,000	273,000	1,536,600
d - Sub-Total	422,000	698,700	769,100	423,500	2,313,300
e - Profit and Payroll Burden Associated with d.	126,600	209,610	230,730	127,050	693,990
f - Sub Contractors	130,000	20,000	20,000	10,000	180,000
g - Sub-Total Labour	678,600	928,310	1,019,830	560,550	3,187,290
2. INDIRECT COSTS:					
h - Furniture & Office Equip.	138,000	---	---	---	138,000
i - Advisor Equip. Kits	150,000	---	---	---	150,000
j - Office Overheads	72,000	172,500	194,750	111,000	550,250
k - Travel Costs	93,950	343,500	389,000	211,000	1,037,450
l - Sub-Total Indirects:	453,950	516,000	583,750	322,000	1,875,700
m - Total Cost Per Yr.	1,132,550	1,444,310	1,603,580	882,550	5,062,990
n - 10% Contingency on (m)	113,255	144,431	160,358	88,255	506,299
3. TOTAL ESTIMATE	1,245,805	1,588,741	1,763,938	970,805	5,569,289

TABLE 5.5 COST SUMMARY FOR MAJOR COMPONENTS
PROPOSED NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISORY PROGRAM

COMPONENT	UNIT COST	%
1.0 Advisor Salary (Incl's. profit, benefits, fringes)	$ 49.95	39
2.0 Advisor Equipment	3.75	3
3.0 Travel, Vehicle Lease, Milage, Meals and Accommodations, Airfare, etc.	25.94	20
4.0 Management and Support Staff (Incl's. profit, benefits, fringes)	25.24	20
5.0 Office Operation, Overhead, Insurance, Communications, etc.	17.21	14
6.0 Information, Promotion, Printing, Training	4.50	4
TOTAL UNIT COST ESTIMATE	$ 126.60	100%

TABLE 5.6 UNIT DELIVERY COST ESTIMATE BY COMPONENT

NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISOR PROGRAM

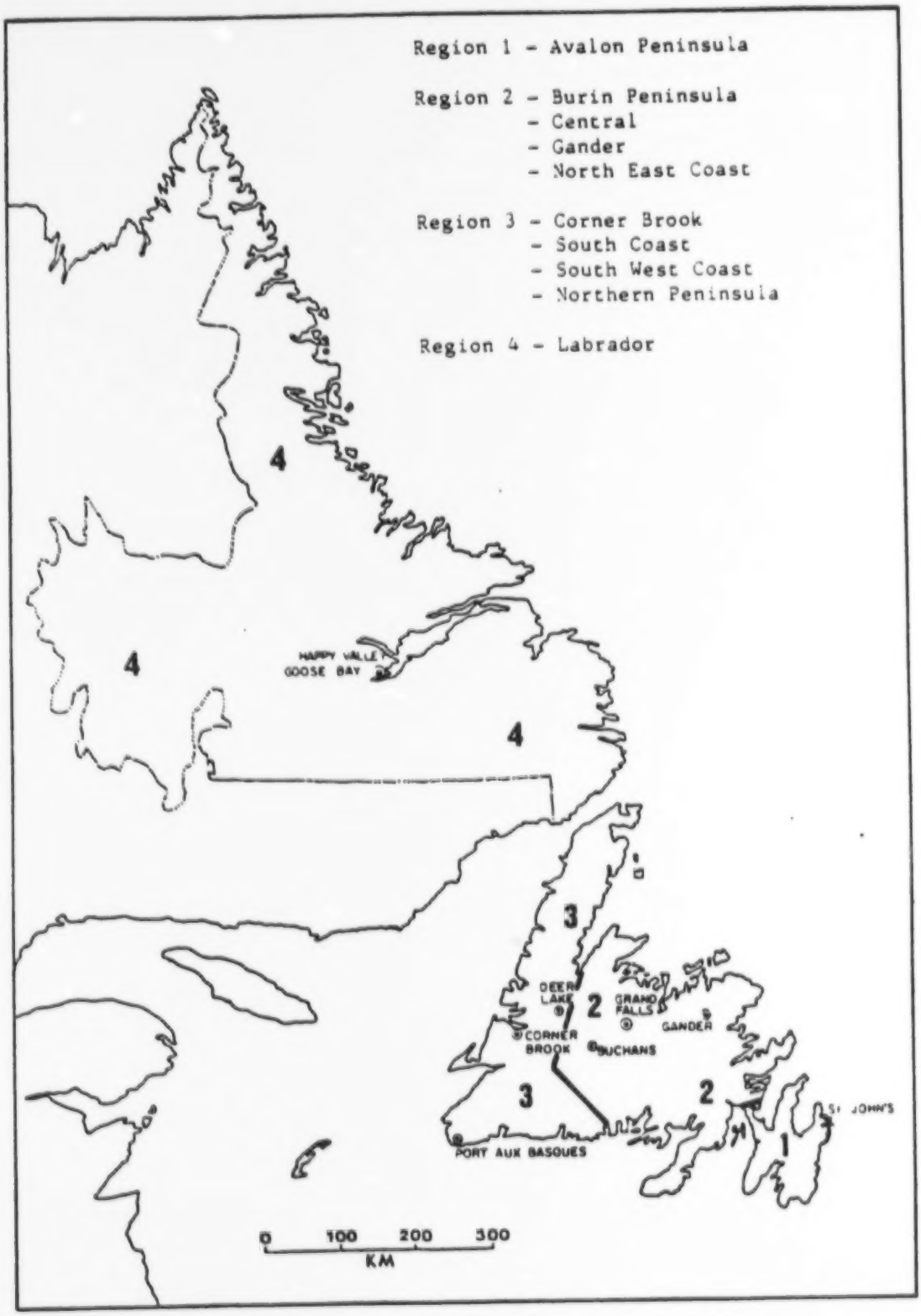

FIGURE 5.1

PROPOSED REGIONAL BOUNDARIES

NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISORY PROGRAM

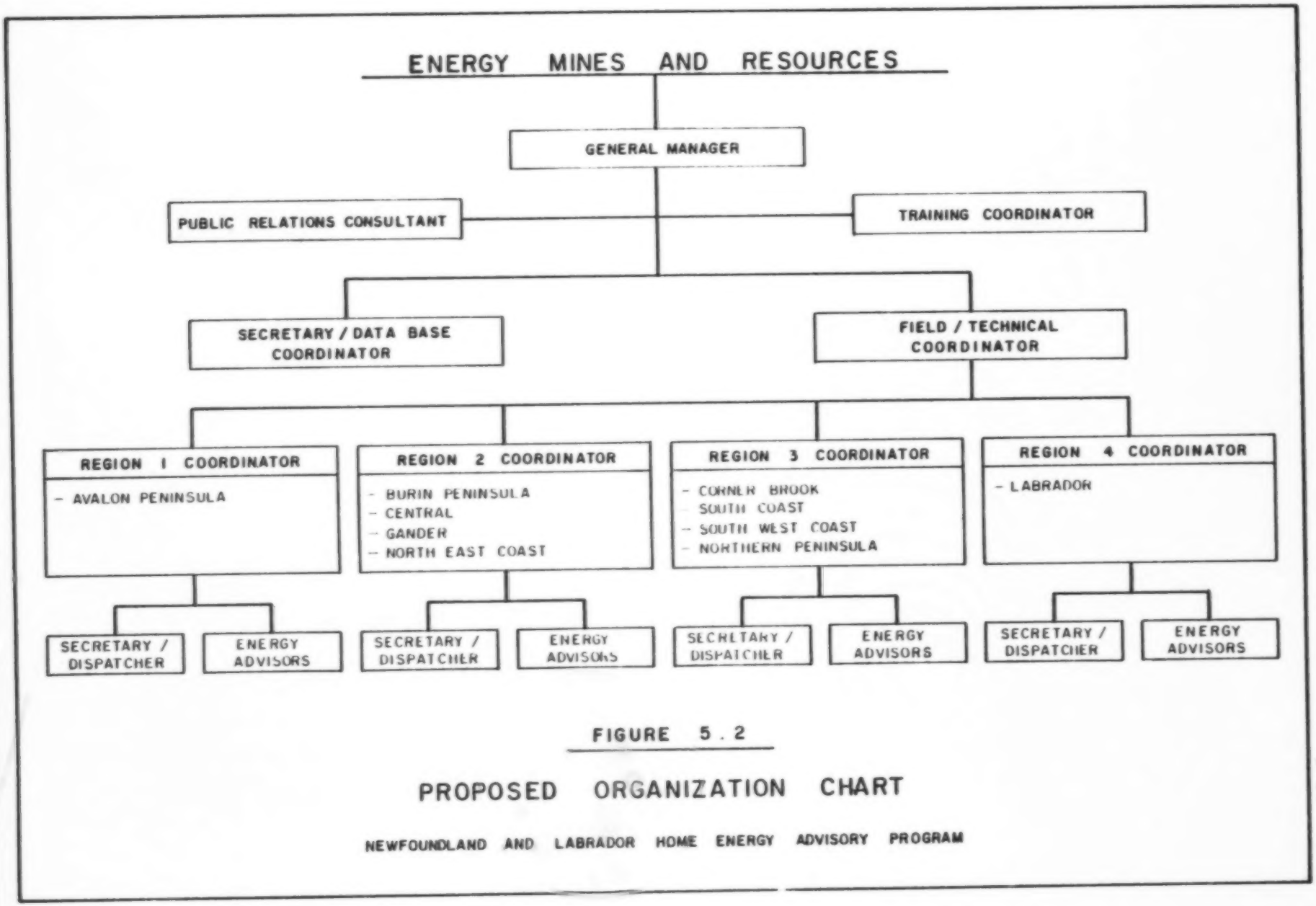

FIGURE 5.2

PROPOSED ORGANIZATION CHART

NEWFOUNDLAND AND LABRADOR HOME ENERGY ADVISORY PROGRAM

POOR

QUALITY

ORIGINAL